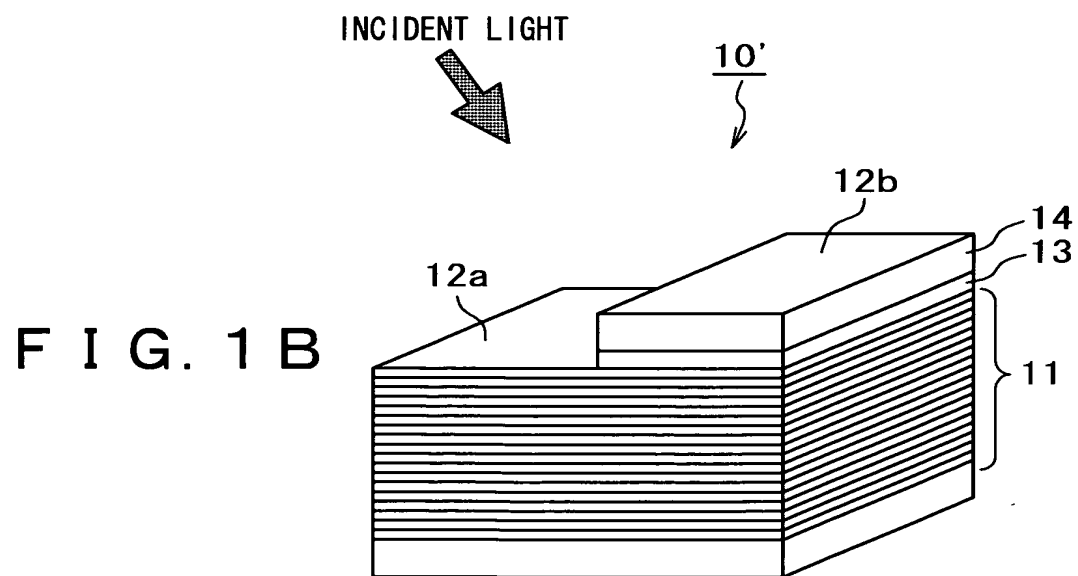
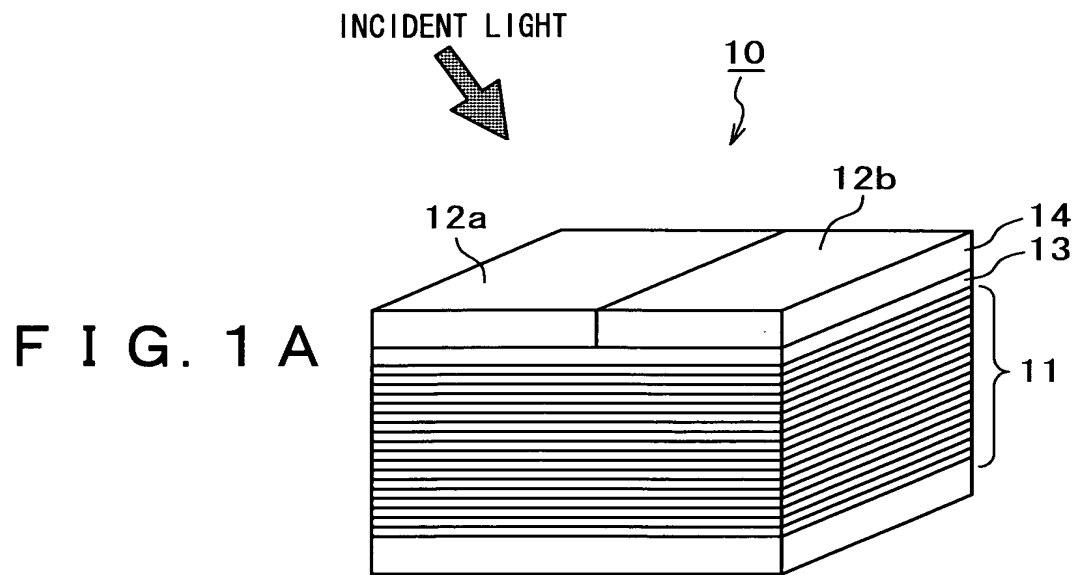
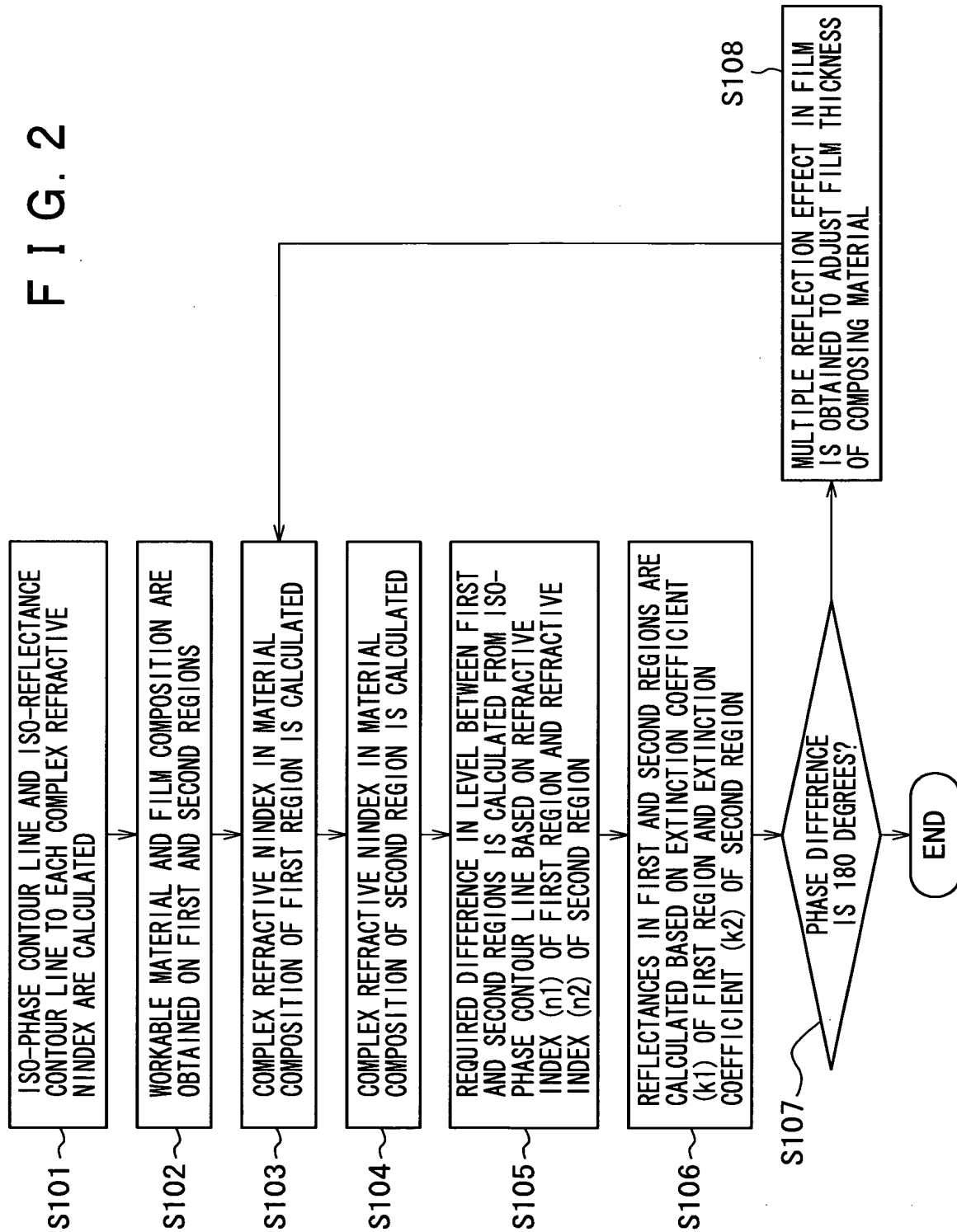


1/48



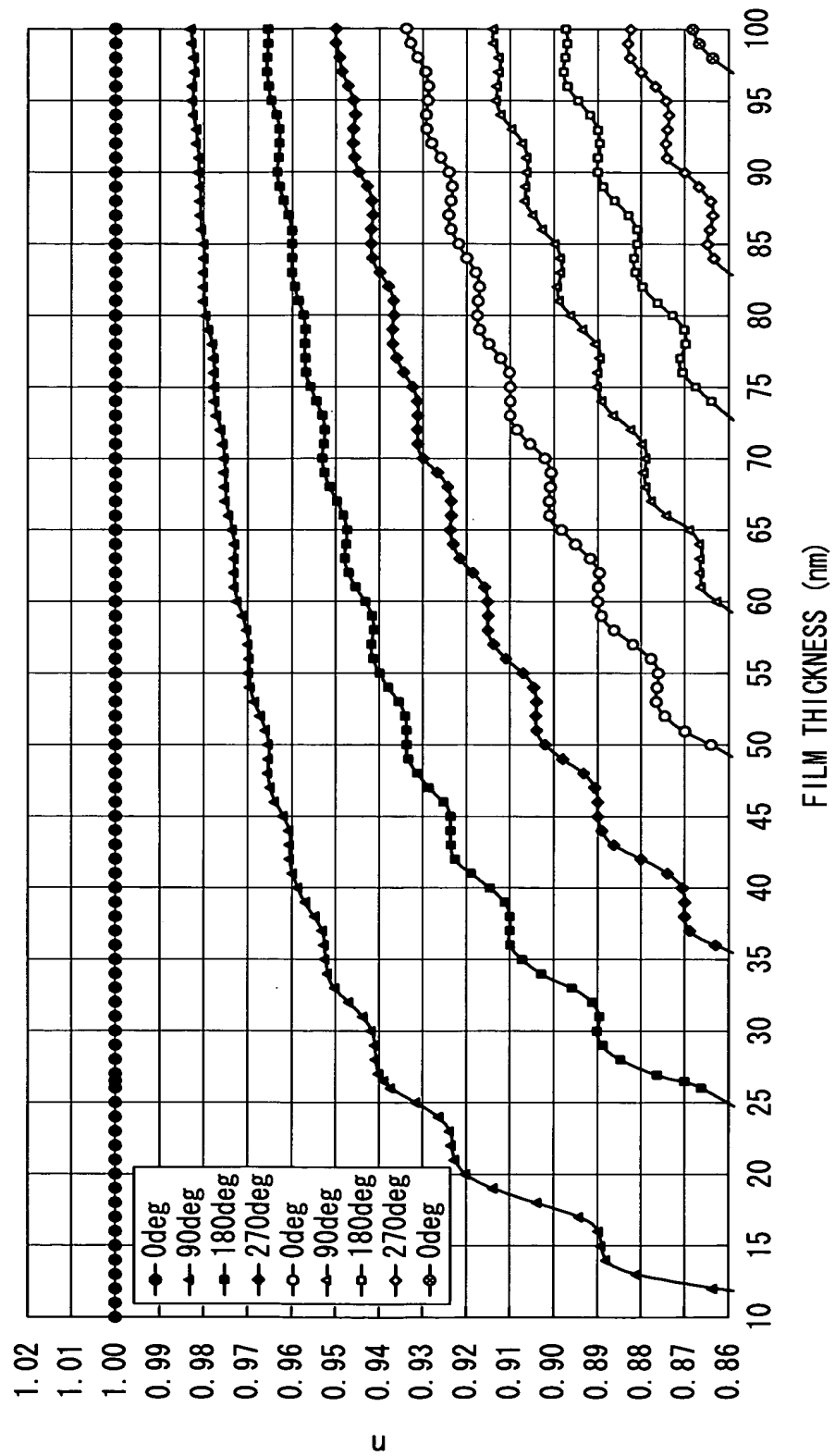
2/48

FIG. 2



3/48

FIG. 3



4 / 48

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FIG. 4

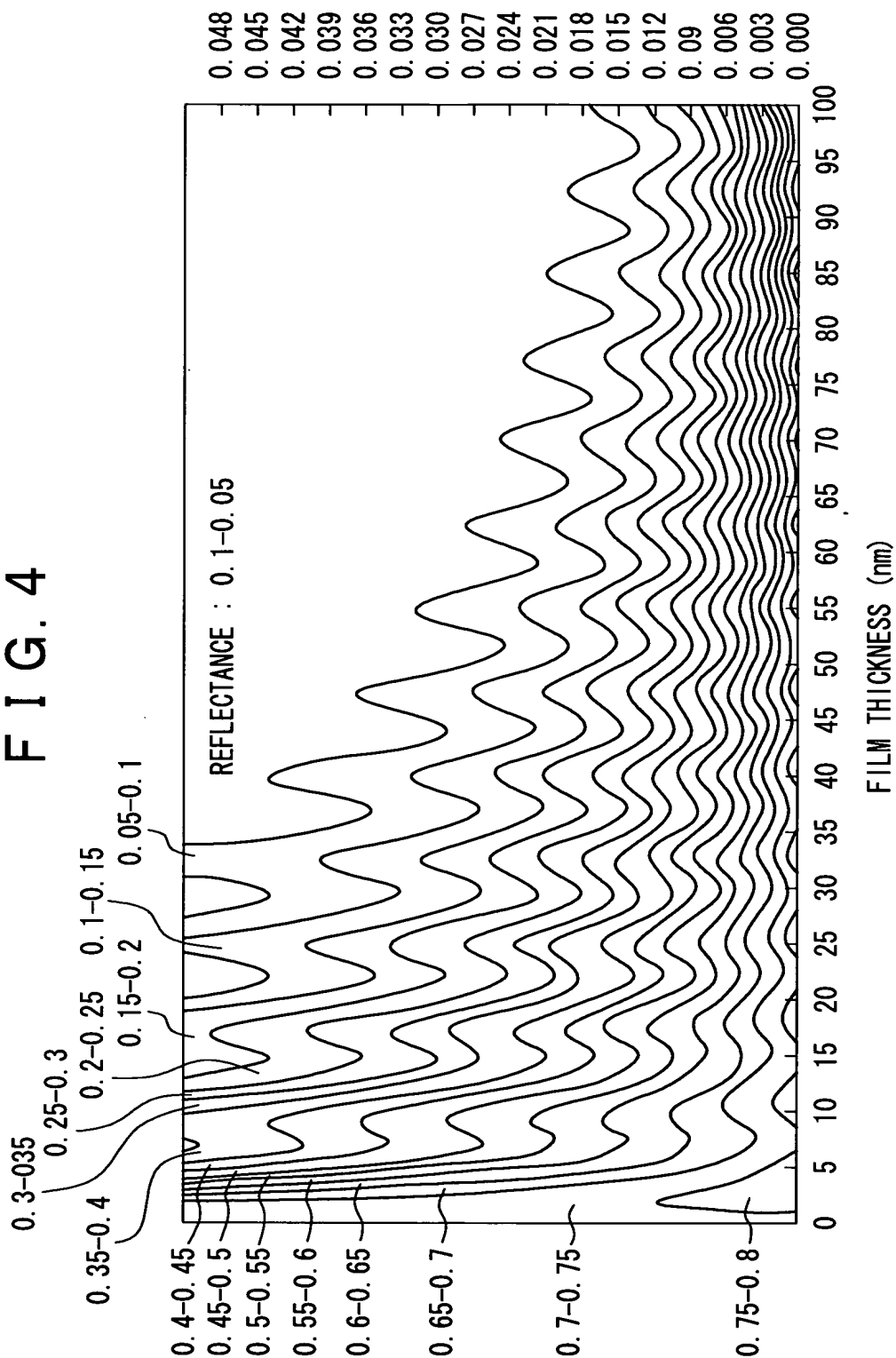
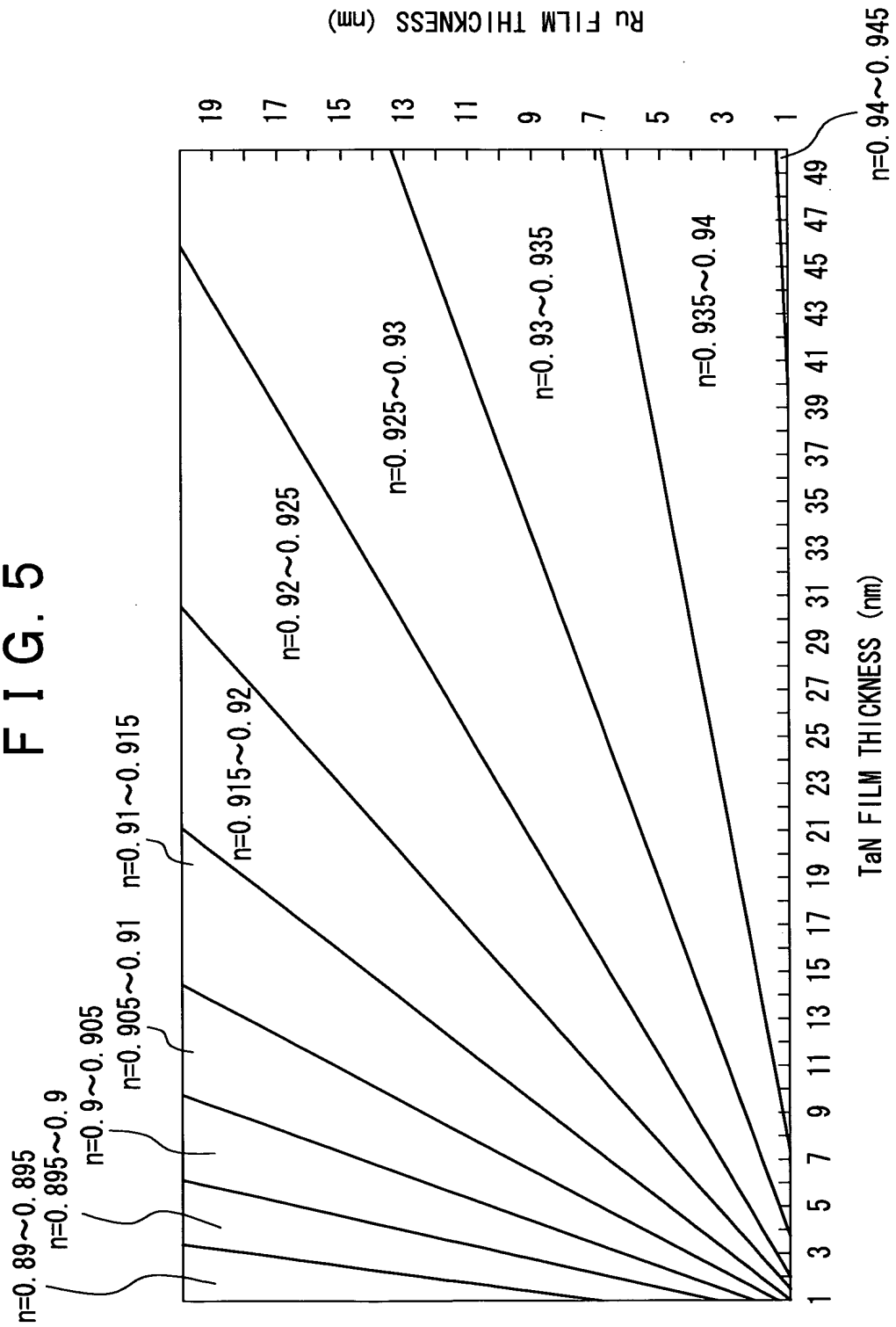
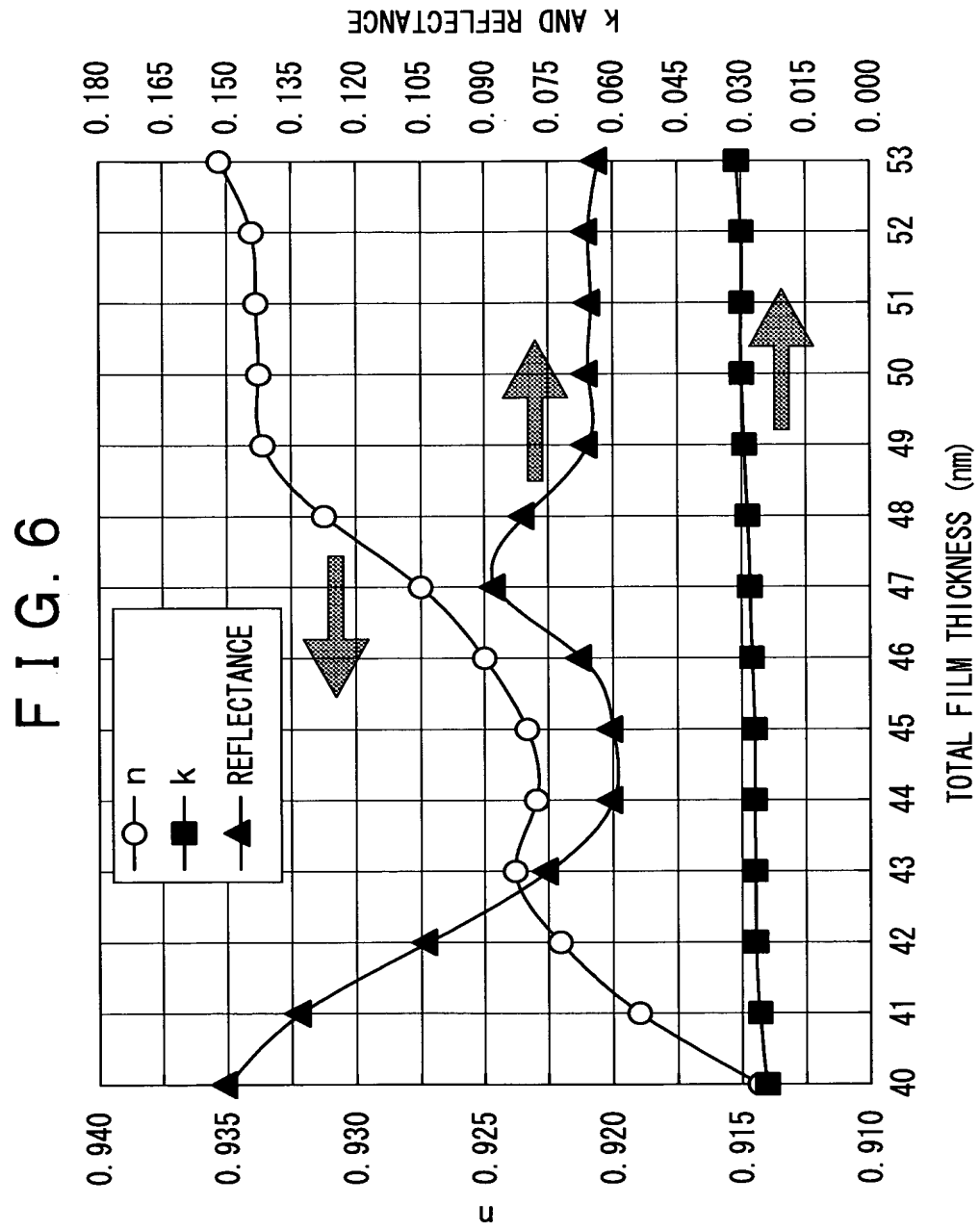


FIG. 5

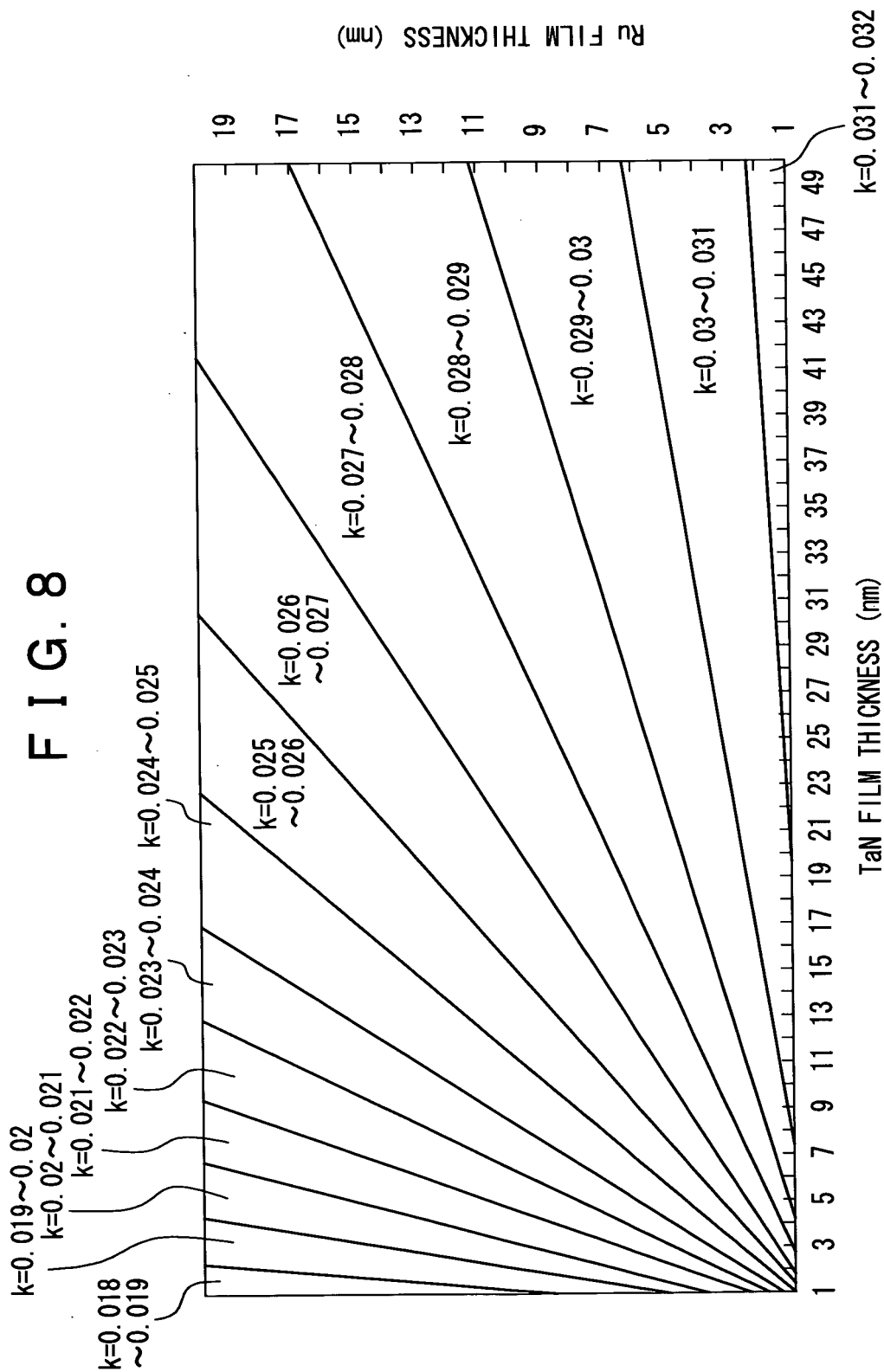


6 / 48



F I G. 7

| TOTAL THICKNESS (nm) | Ru THICKNESS (nm) | TaN THICKNESS (nm) |
|----------------------|-------------------|--------------------|
| 40 | 20 | 20 |
| 41 | 17 | 24 |
| 42 | 15 | 27 |
| 43 | 14 | 29 |
| 44 | 15 | 29 |
| 45 | 15 | 30 |
| 46 | 14 | 32 |
| 47 | 12 | 35 |
| 48 | 9 | 39 |
| 49 | 7 | 42 |
| 50 | 7 | 43 |
| 51 | 7 | 44 |
| 52 | 7 | 45 |
| 53 | 6 | 47 |



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| PHASE DIFFERENCE | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| Ru/1an | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | |
| 3 | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | | | |

| HALF TONE REFLECTANCE RANGE 8-10 4-6 % | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| Ru/1an | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | |
| 3 | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | | | |

PHASE DIFFERENCE

| PHASE DIFFERENCE | | | | | | | | | | | | | | |
|------------------|-------|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| Ru/Cr | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | |
| 0 | | | | | | 106.3 | 159.4 | 168.7 | 178.9 | 186.2 | 186.8 | 180.9 | 177.5 | |
| 1 | | | | | | | | | | 133.953 | 128.115 | 124.696 | 129.087 | |
| 2 | | | | | | | | | | | 126.647 | 130.742 | 140.4 | |
| 3 | | | | | | | | | | | 134.212 | 143.416 | 154.824 | |
| 4 | | | | | | | | | | 138.817 | 147.444 | 158.579 | 168.608 | |
| 5 | | | | | | | | | 158.6 | 151.3 | 162.2 | 172.4 | 177.5 | |
| 6 | | | | | | | | 146.2 | 154.0 | 164.7 | 175.0 | 180.5 | 177.2 | |
| 7 | | | | | | | 147.361 | 155.0 | 165.7 | 176.0 | 181.7 | 178.6 | 170.8 | |
| 8 | | | | | | 147.4 | 155.0 | 165.8 | 176.1 | 181.7 | 178.7 | 170.9 | 169.9 | |
| 9 | | | 286.0 | 146.5 | 148.0 | 155.5 | 166.1 | 176.4 | 182.1 | 179.2 | 171.6 | 170.5 | 177.8 | |
| 10 | | 153.3 | 149.2 | 150.3 | 157.5 | 167.9 | 178.1 | 184.0 | 181.7 | 174.4 | 173.034 | 179.92 | 191.385 | |
| 11 | 157.9 | 153.9 | 154.6 | 161.2 | 171.2 | 181.35 | 187.667 | 186.276 | 179.45 | 177.51 | 183.68 | 194.657 | 206.692 | |
| 12 | 159.5 | 159.6 | 165.6 | 175.3 | 185.39 | 192.153 | 191.711 | 185.37 | 182.8 | 188.174 | 198.644 | 210.516 | 219.835 | |
| 13 | 164.0 | 169.5 | 178.9 | 188.971 | 196.115 | 196.419 | 190.458 | 187.361 | 192.079 | 202.151 | | | | |
| 14 | 172 | 181 | 191.146 | 198.528 | 199.238 | 193.435 | 194.351 | 204.231 | 215.995 | | | | | |

[illegible]

HALF TONE REFLECTANCE 4-6%

[illegible]

FIG. 12

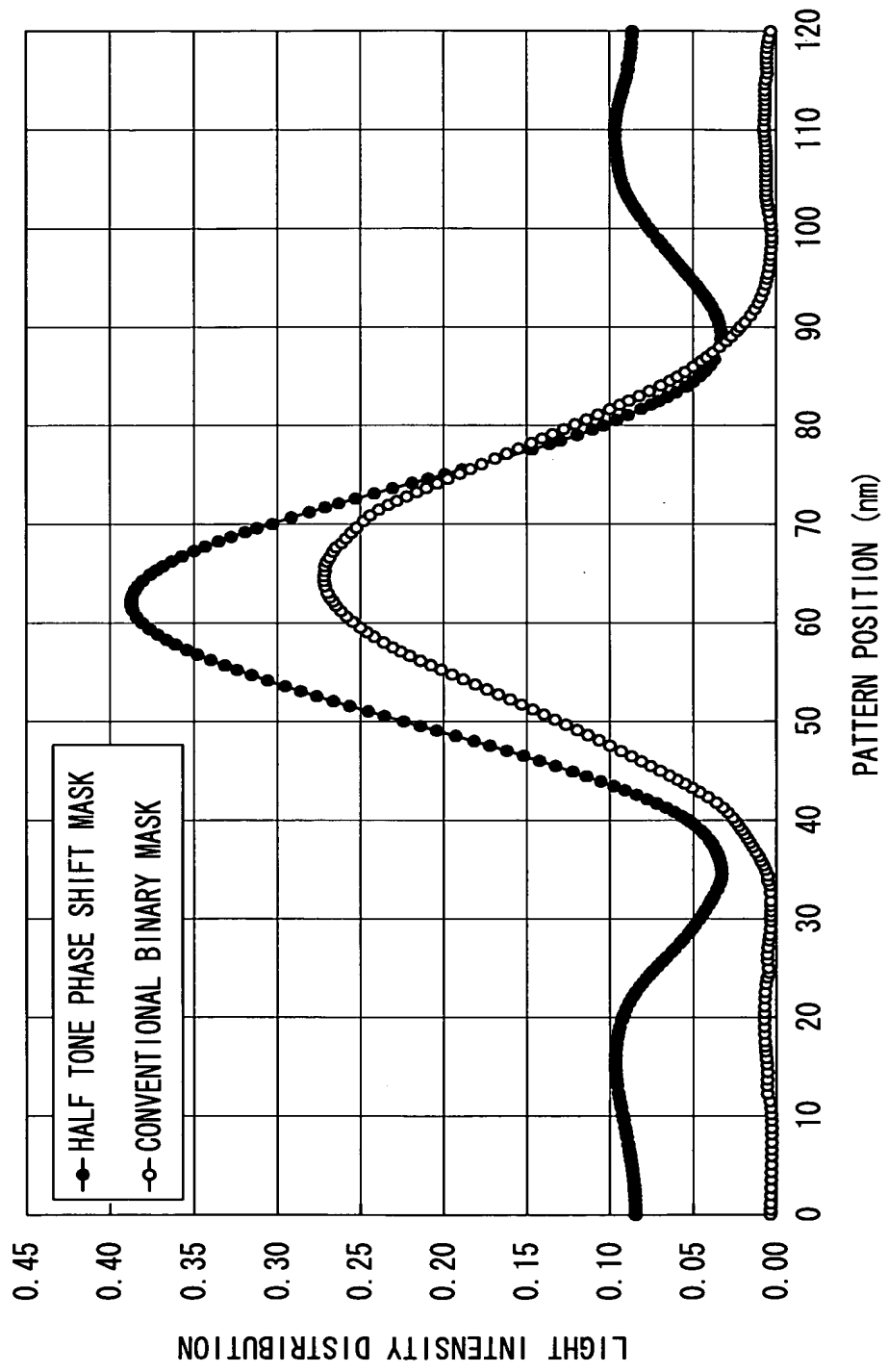
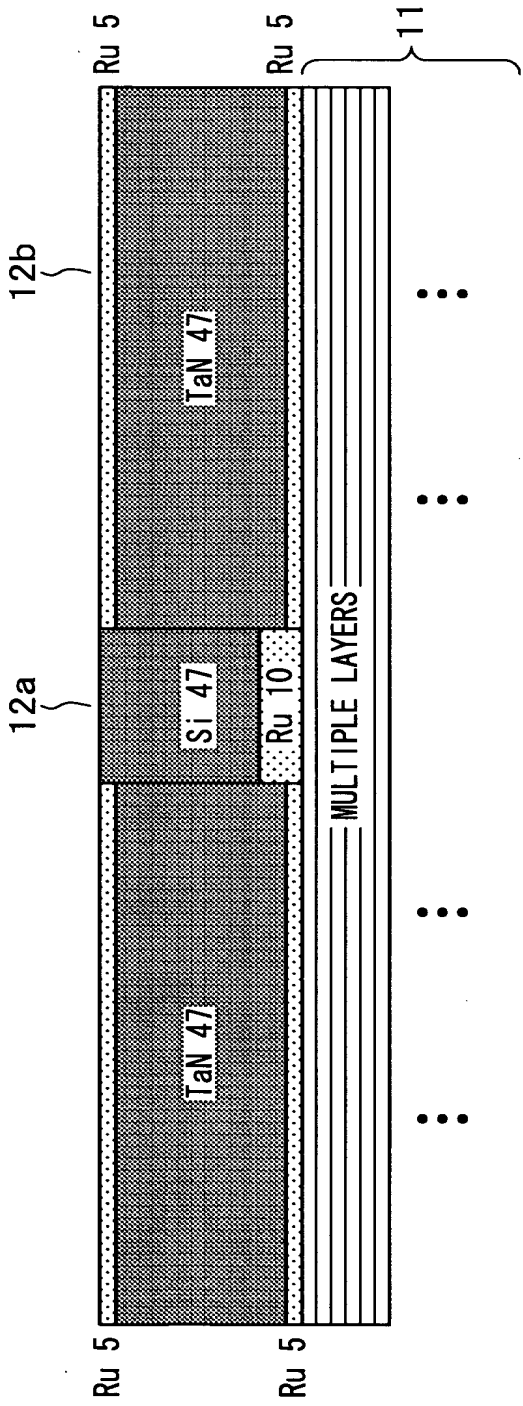
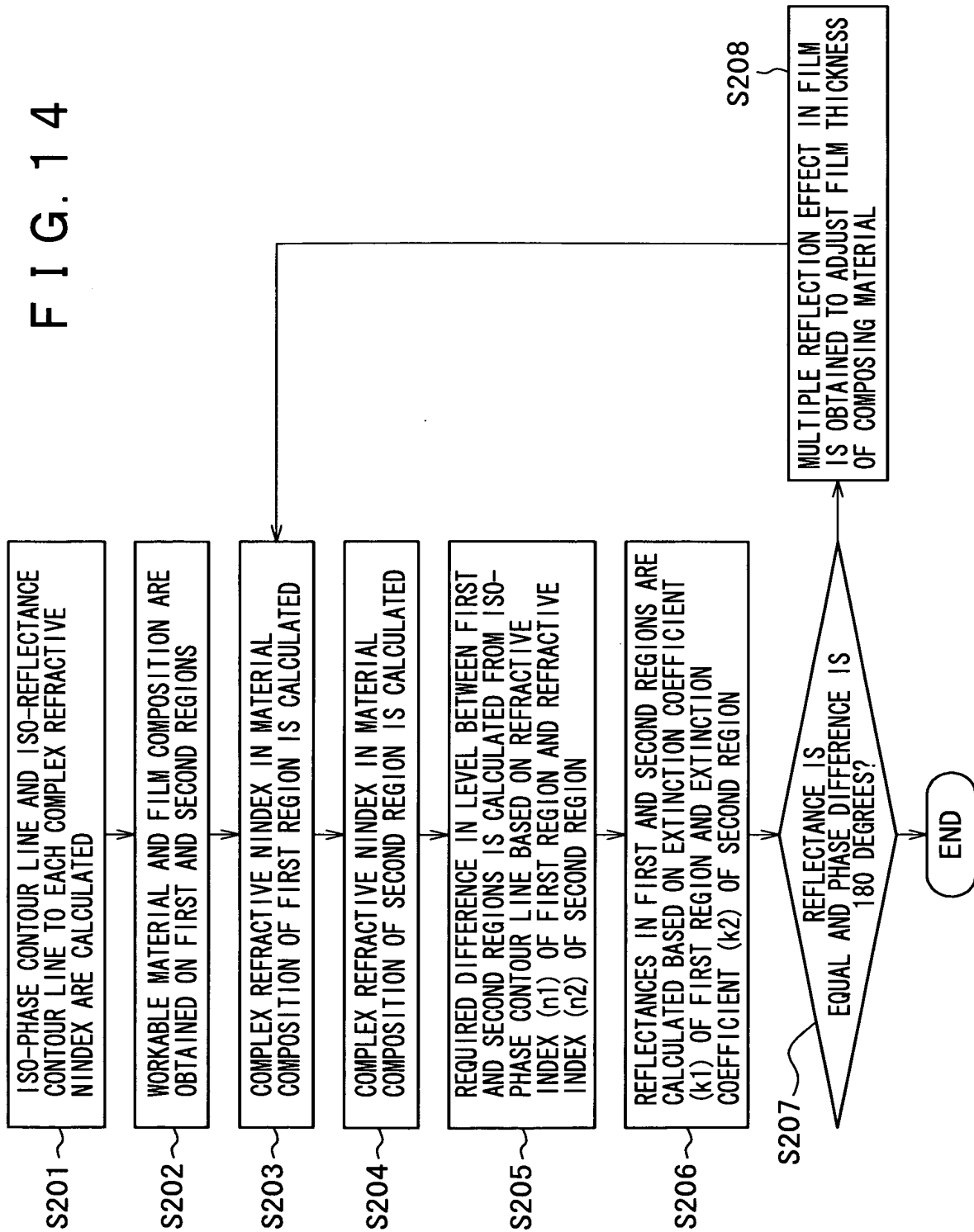


FIG. 13



14/48

FIG. 14



15/48

FIG. 15

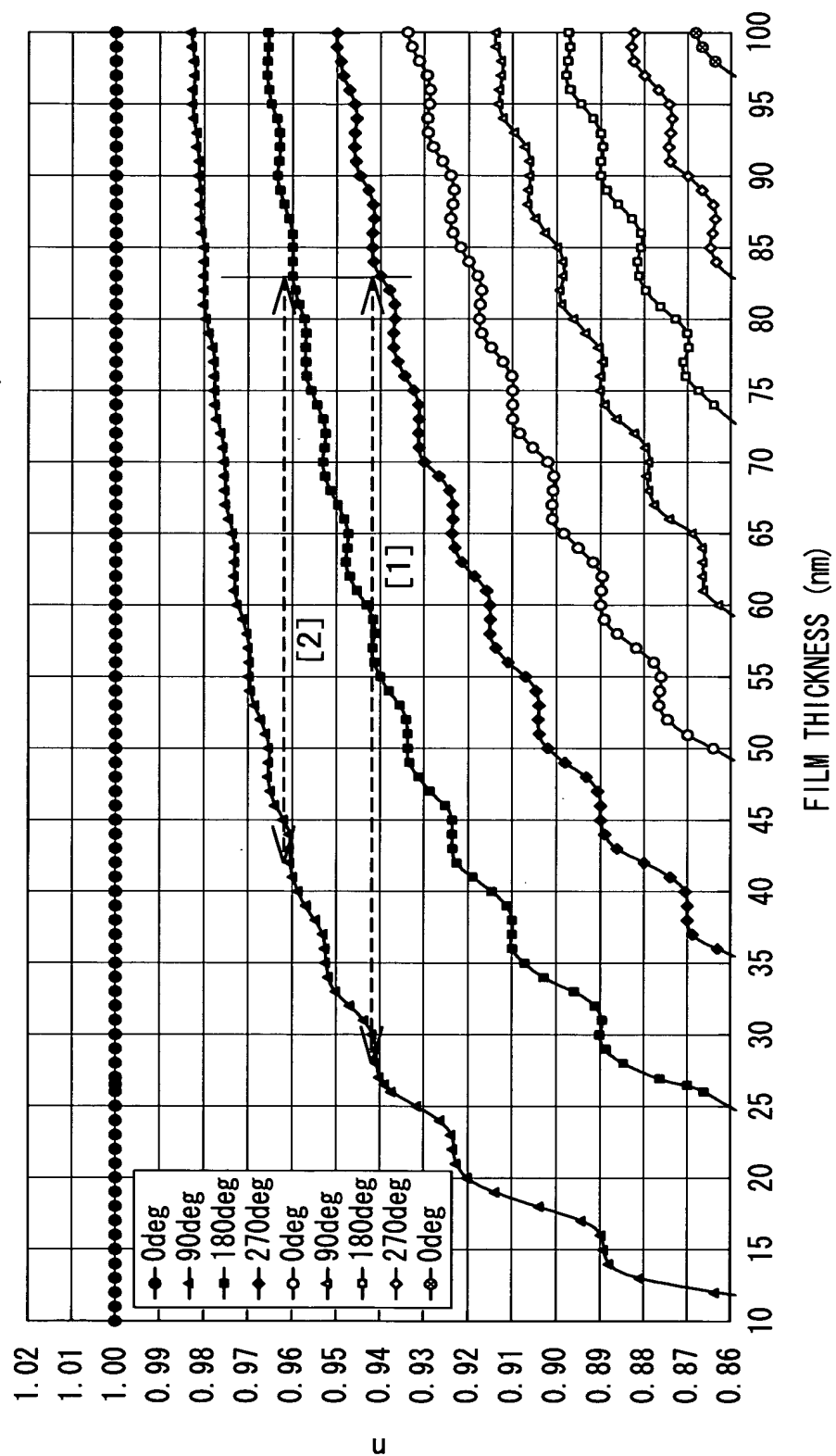
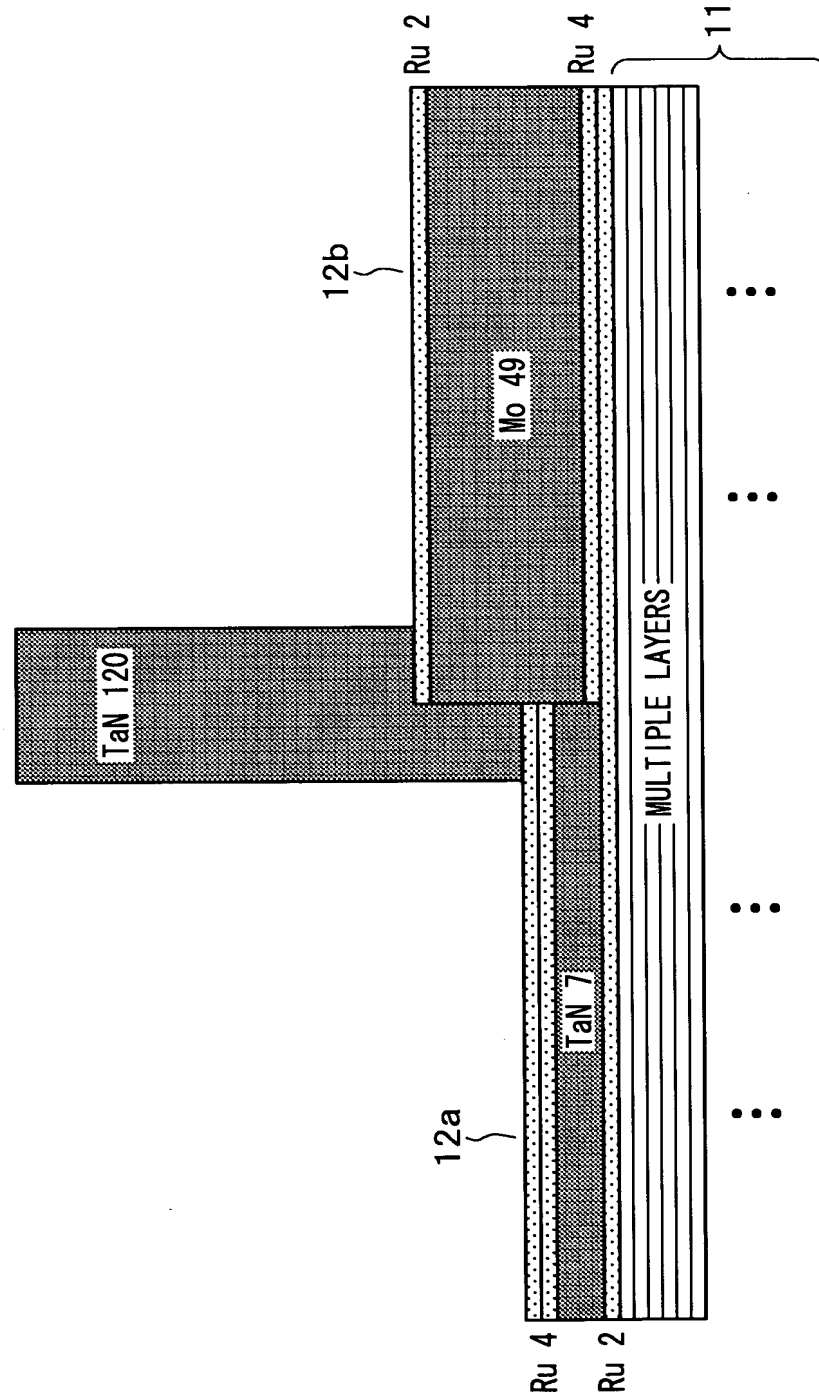
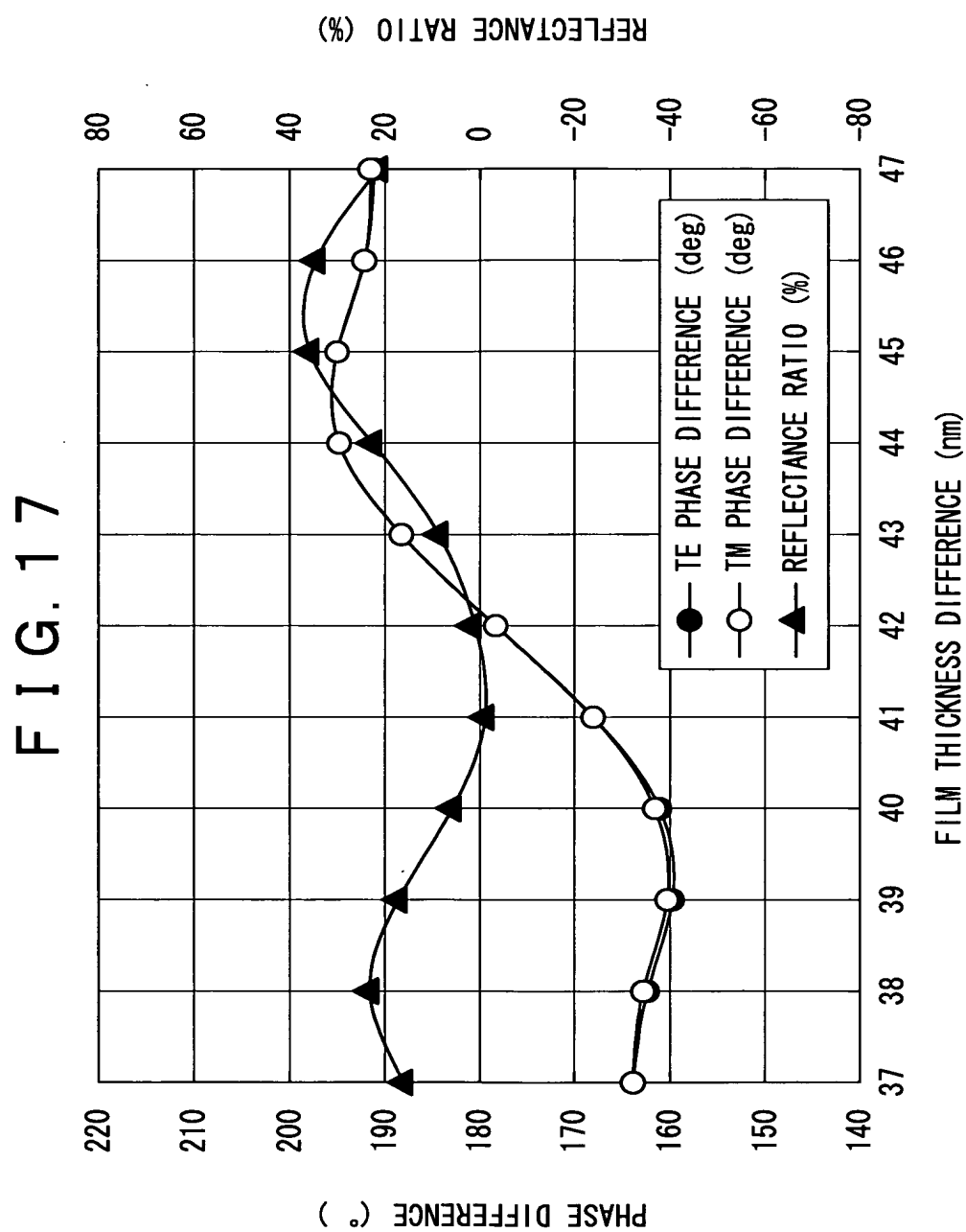


FIG. 16

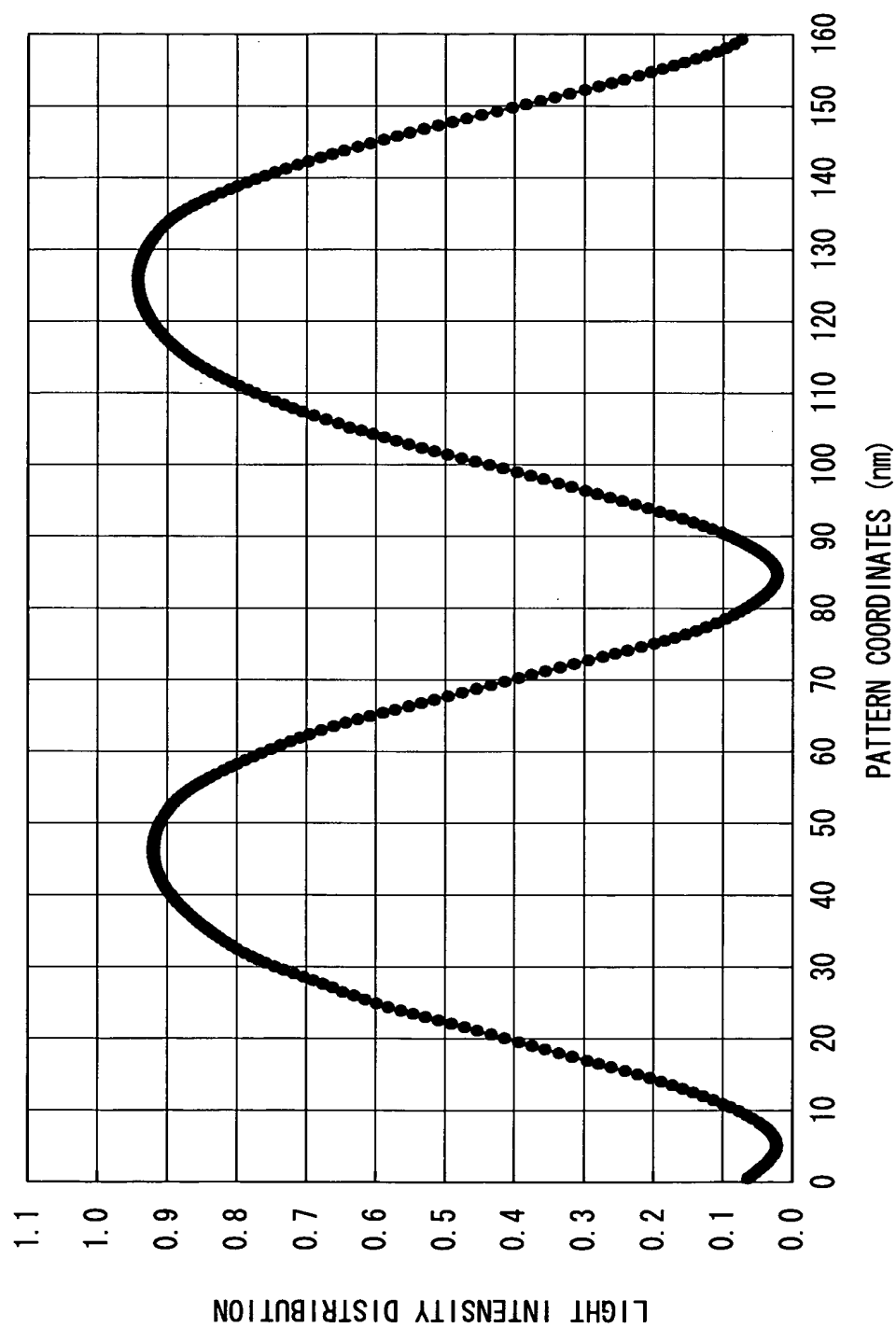


17/48



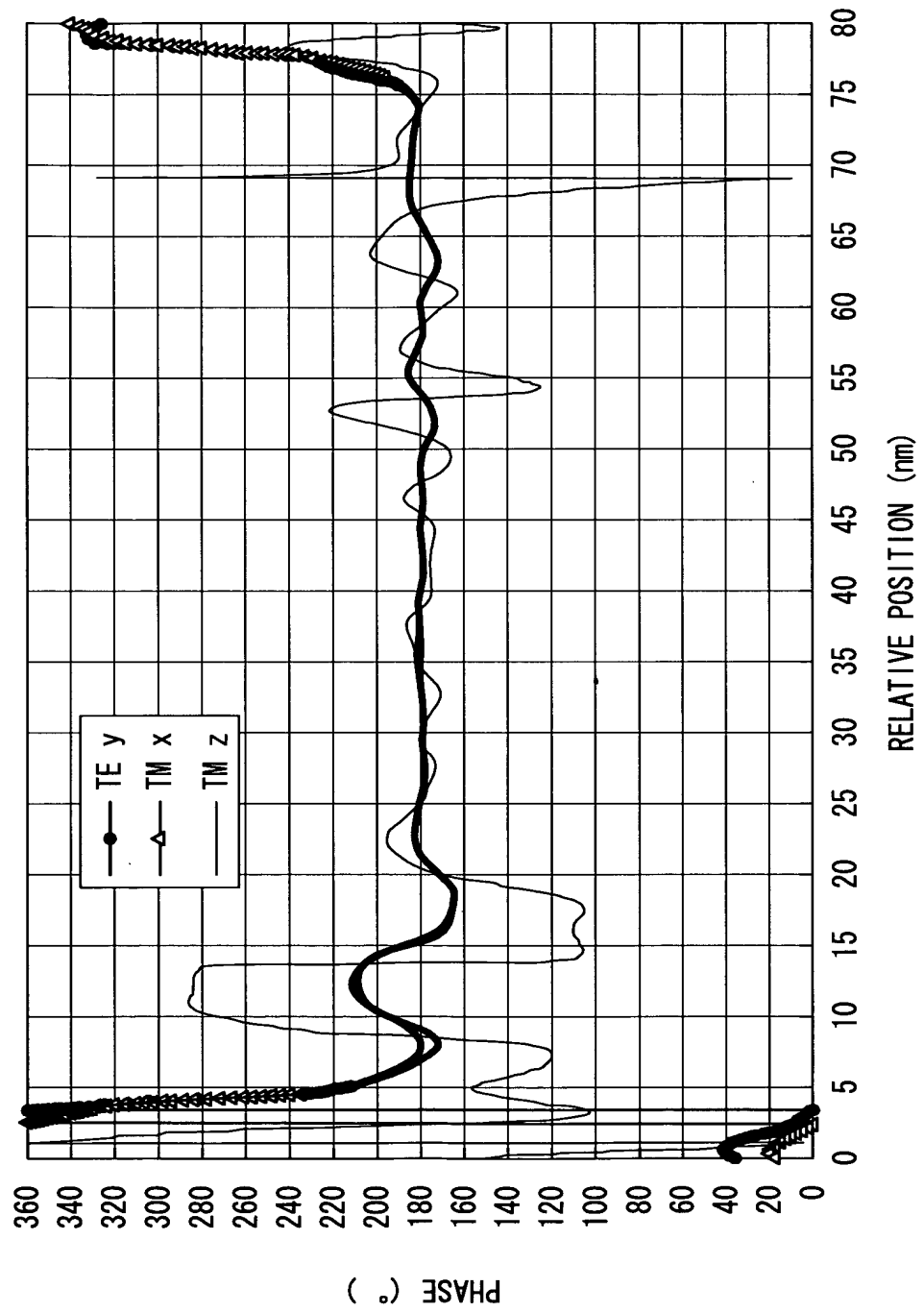
18/48

FIG. 18



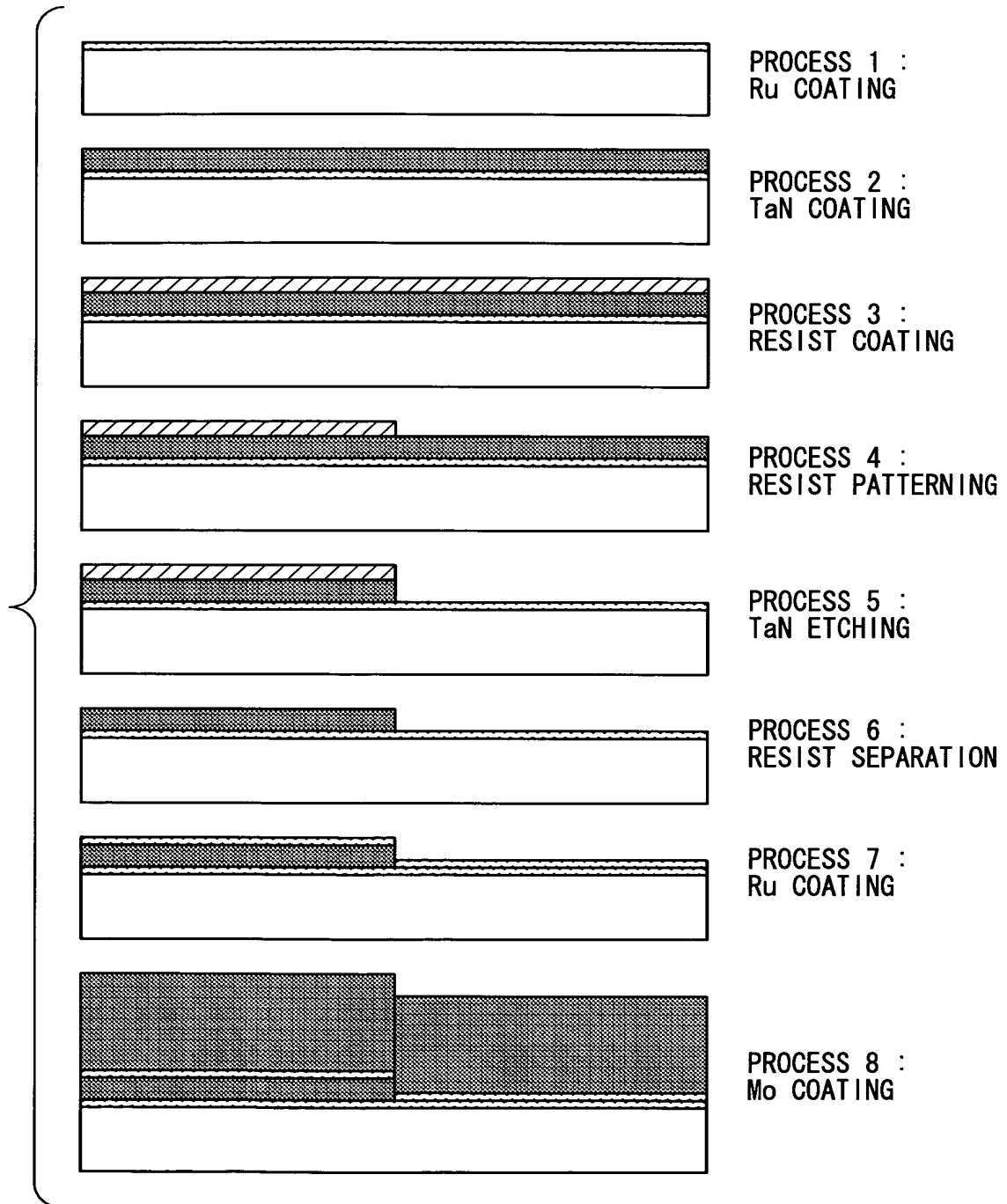
19/48

FIG. 19



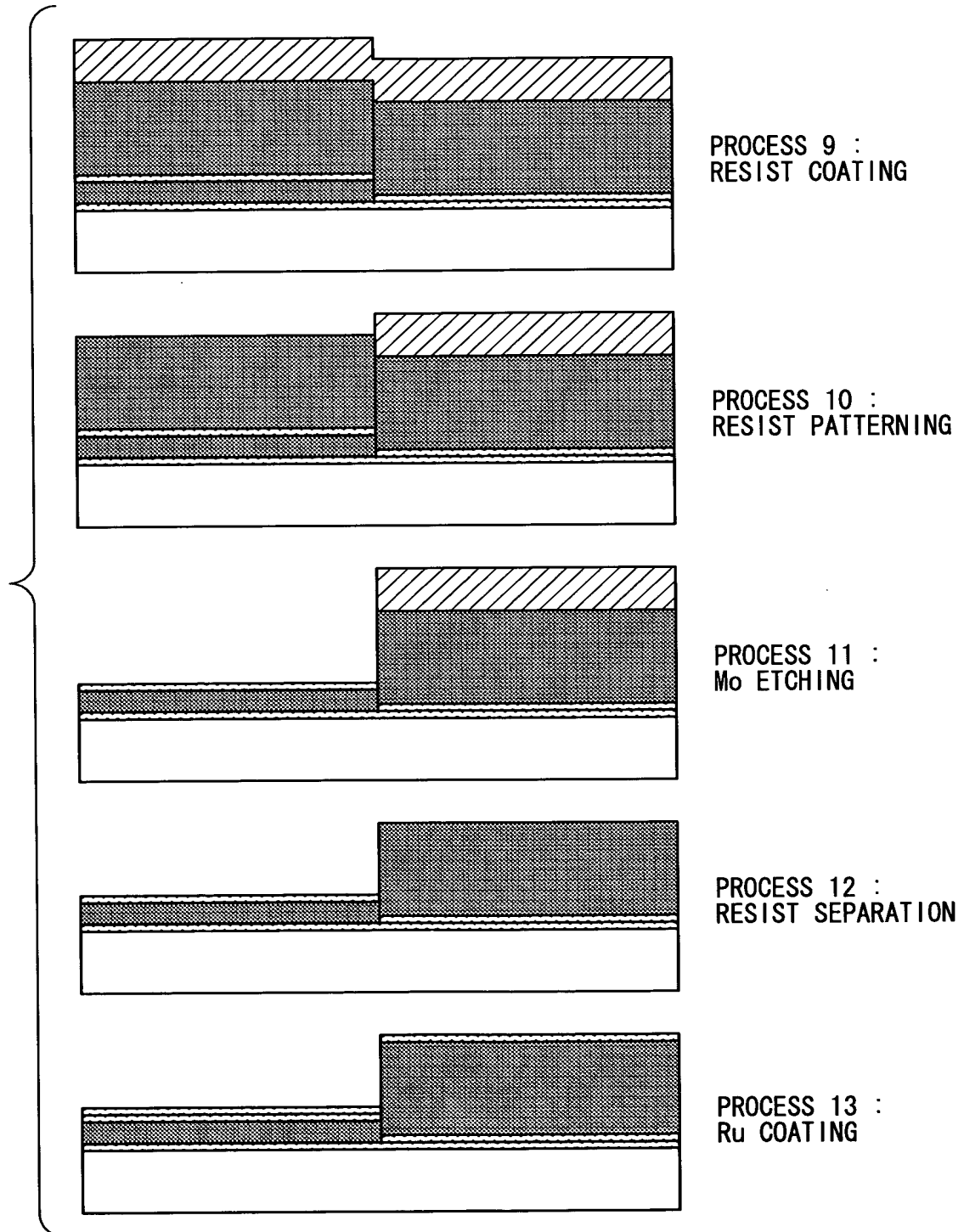
20/48

FIG. 20



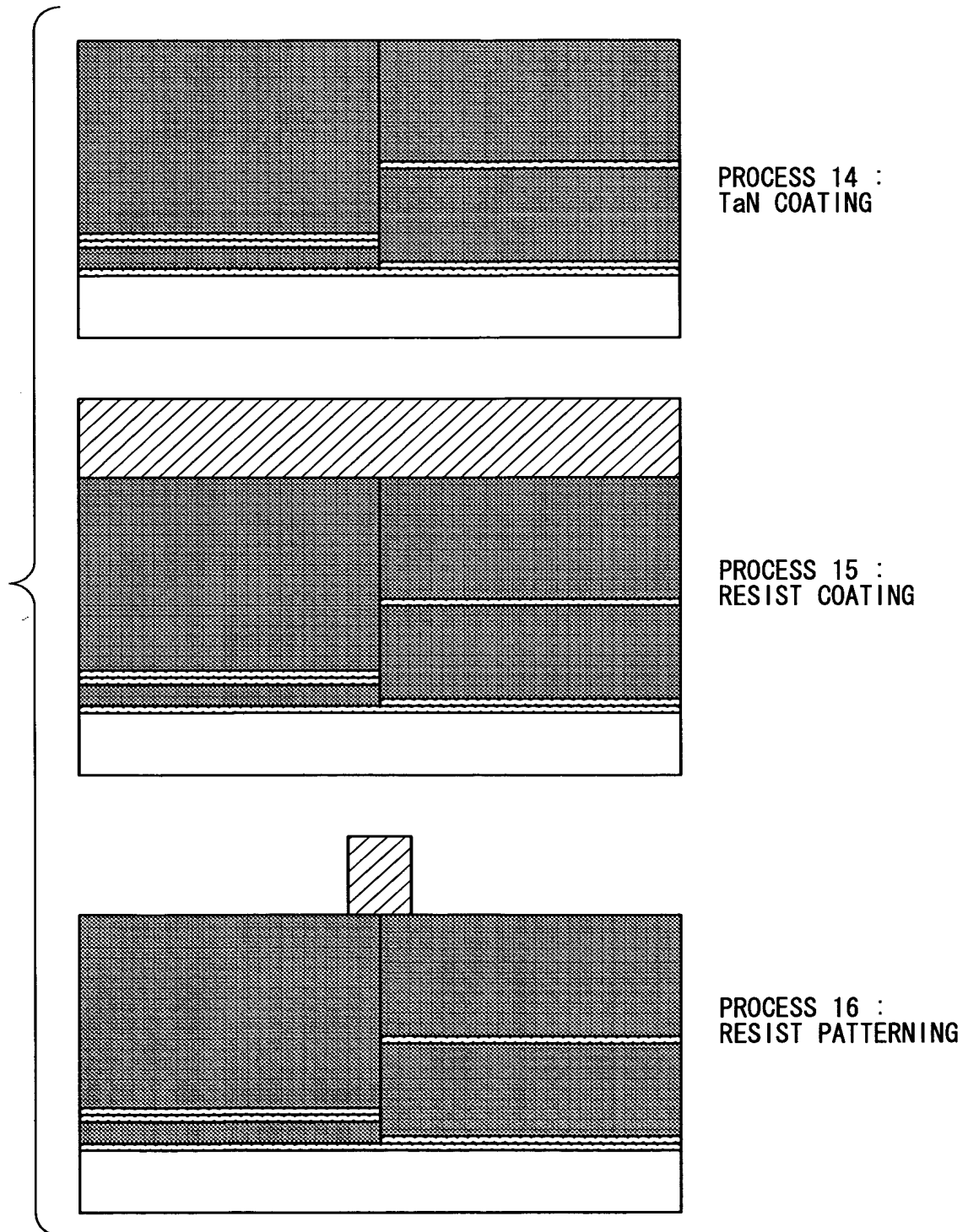
21/48

FIG. 21



22/48

F I G. 2 2



23/48

F I G. 2 3

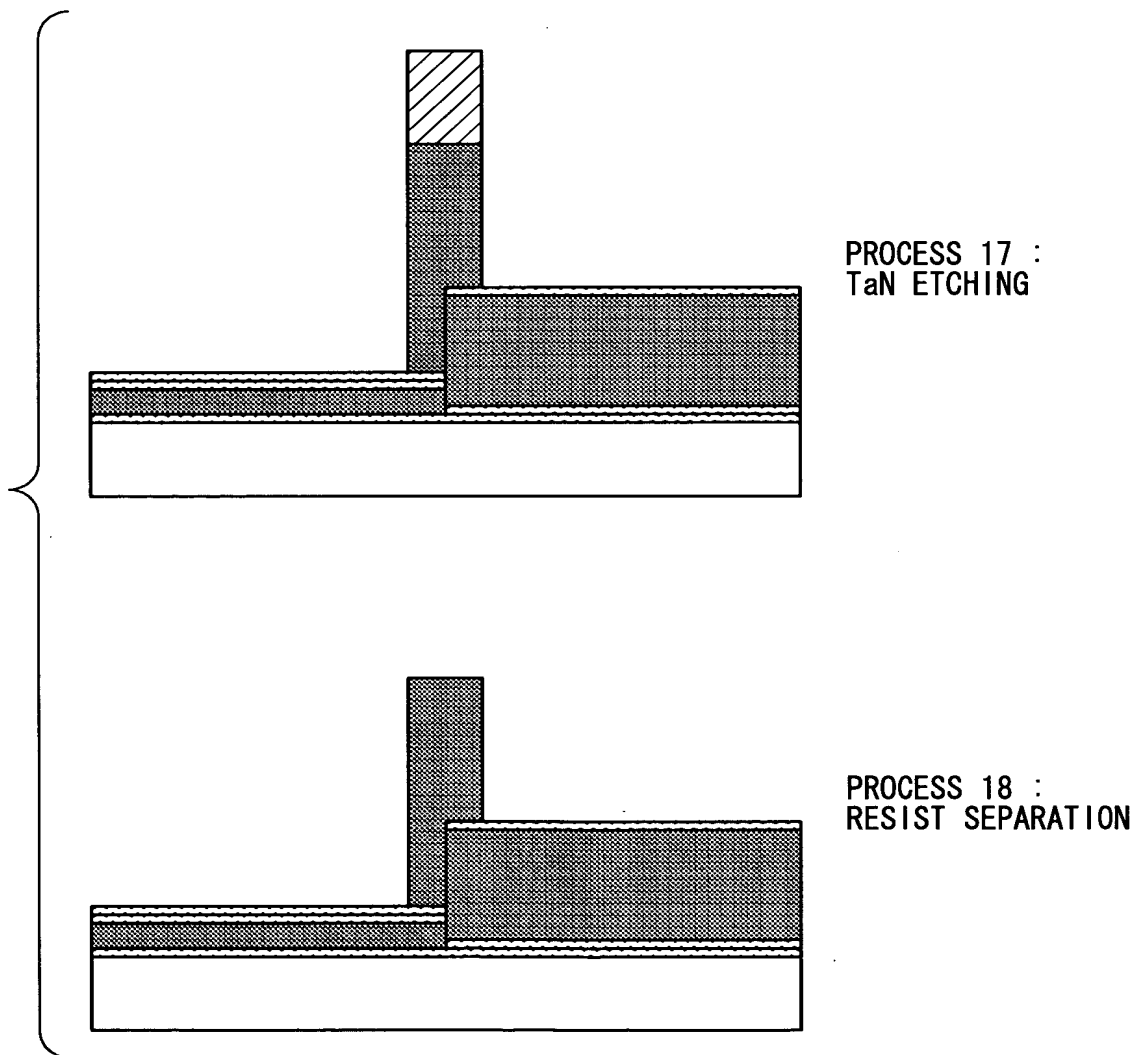
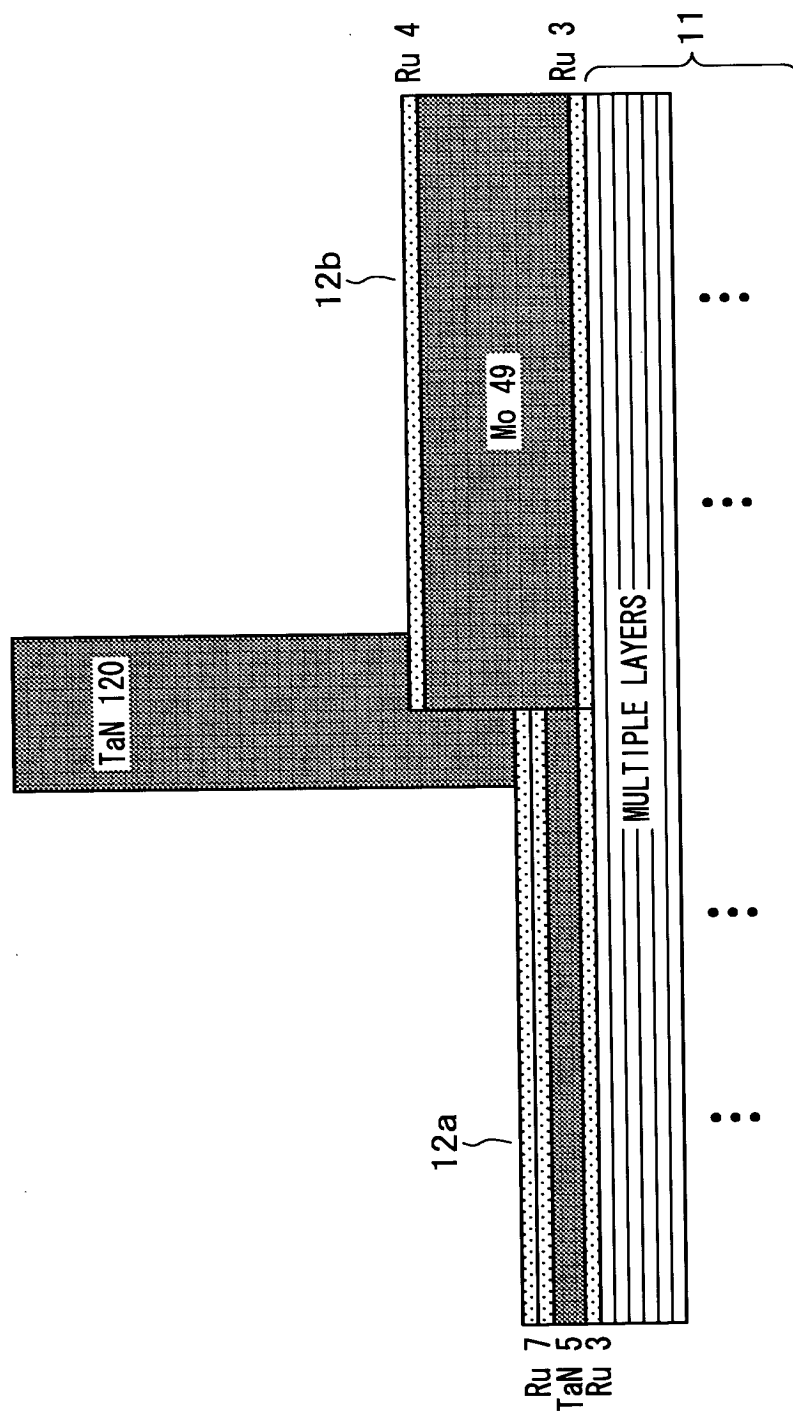
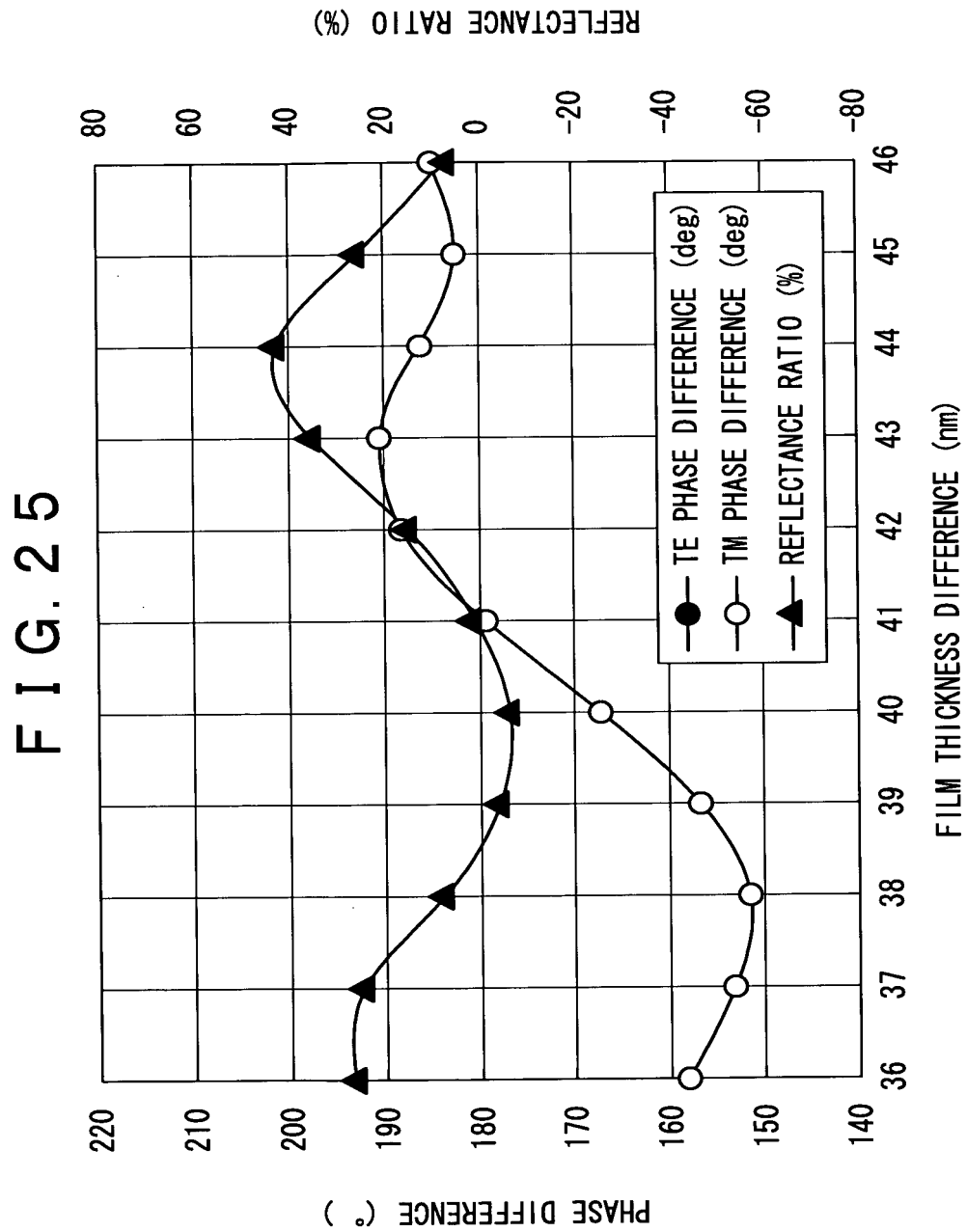


FIG. 24

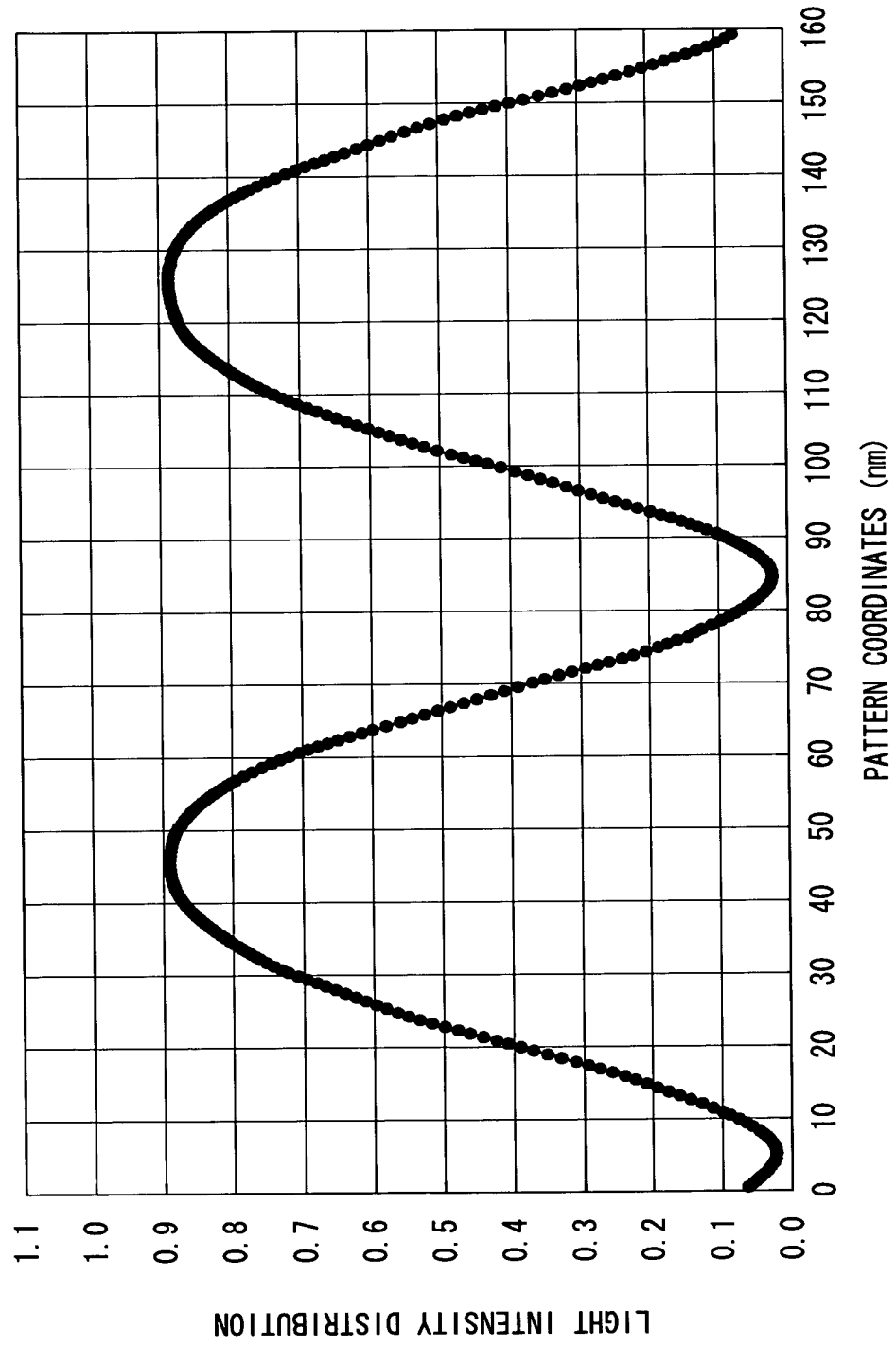


25 / 48



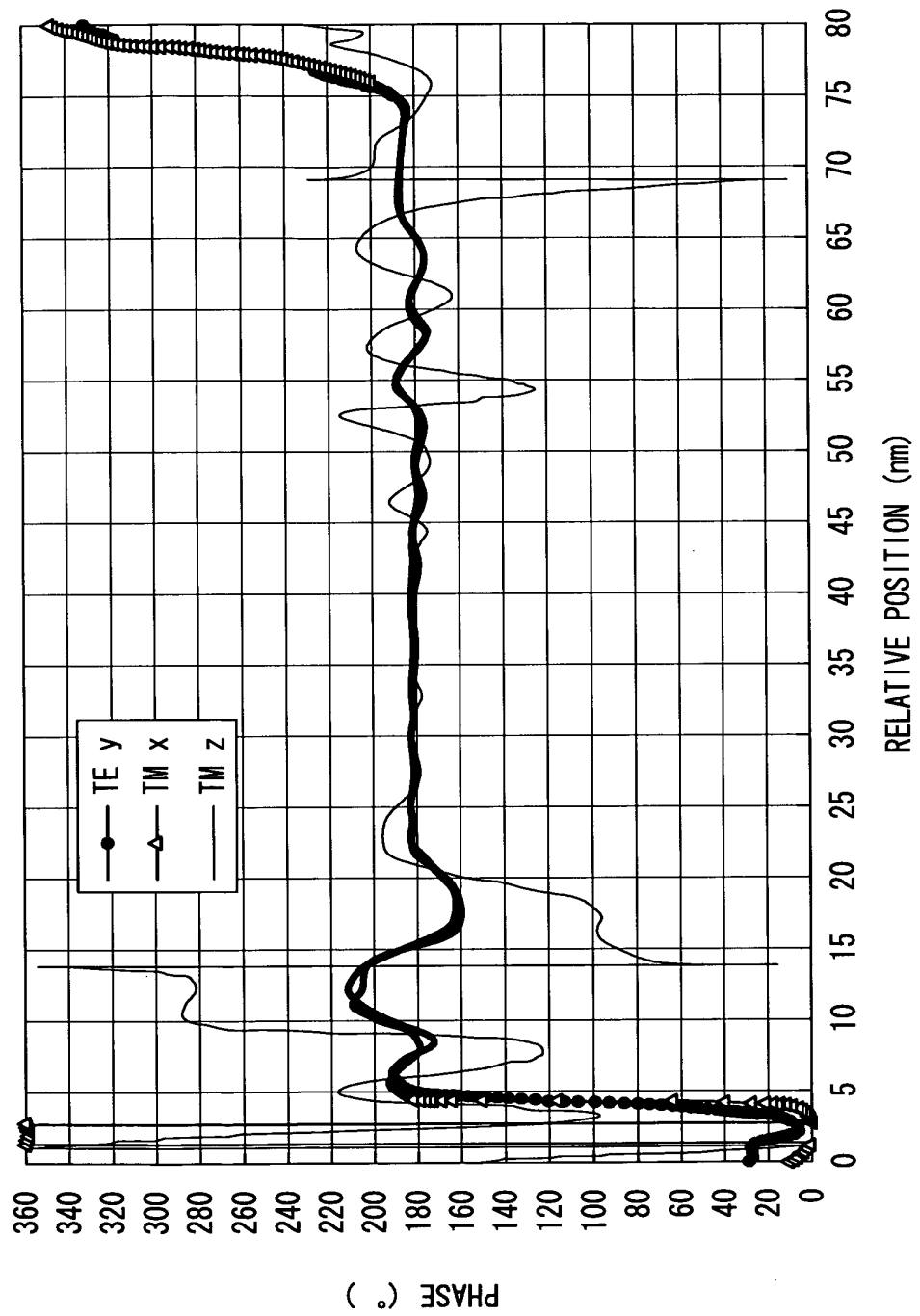
26/48

FIG. 26



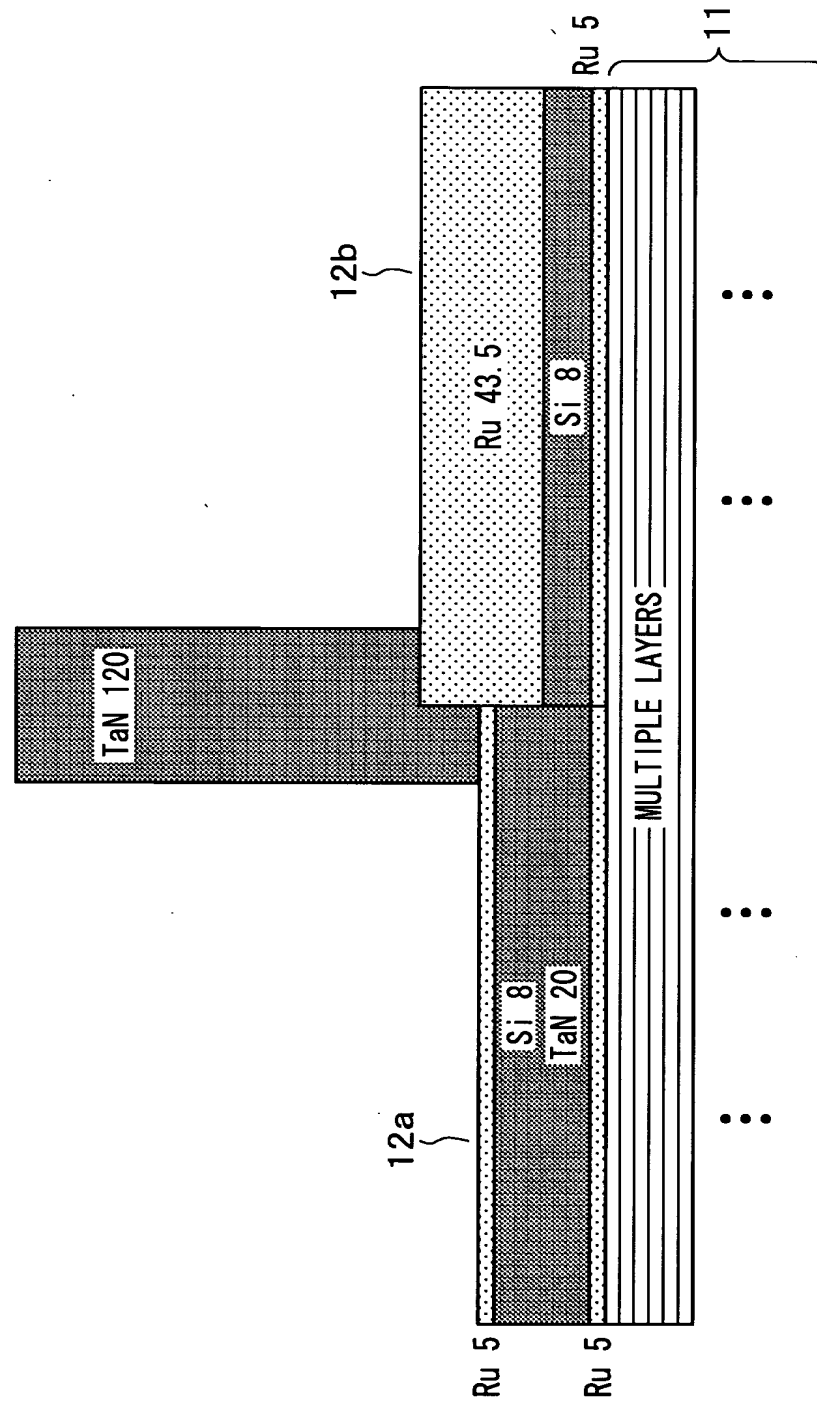
27/48

FIG. 27

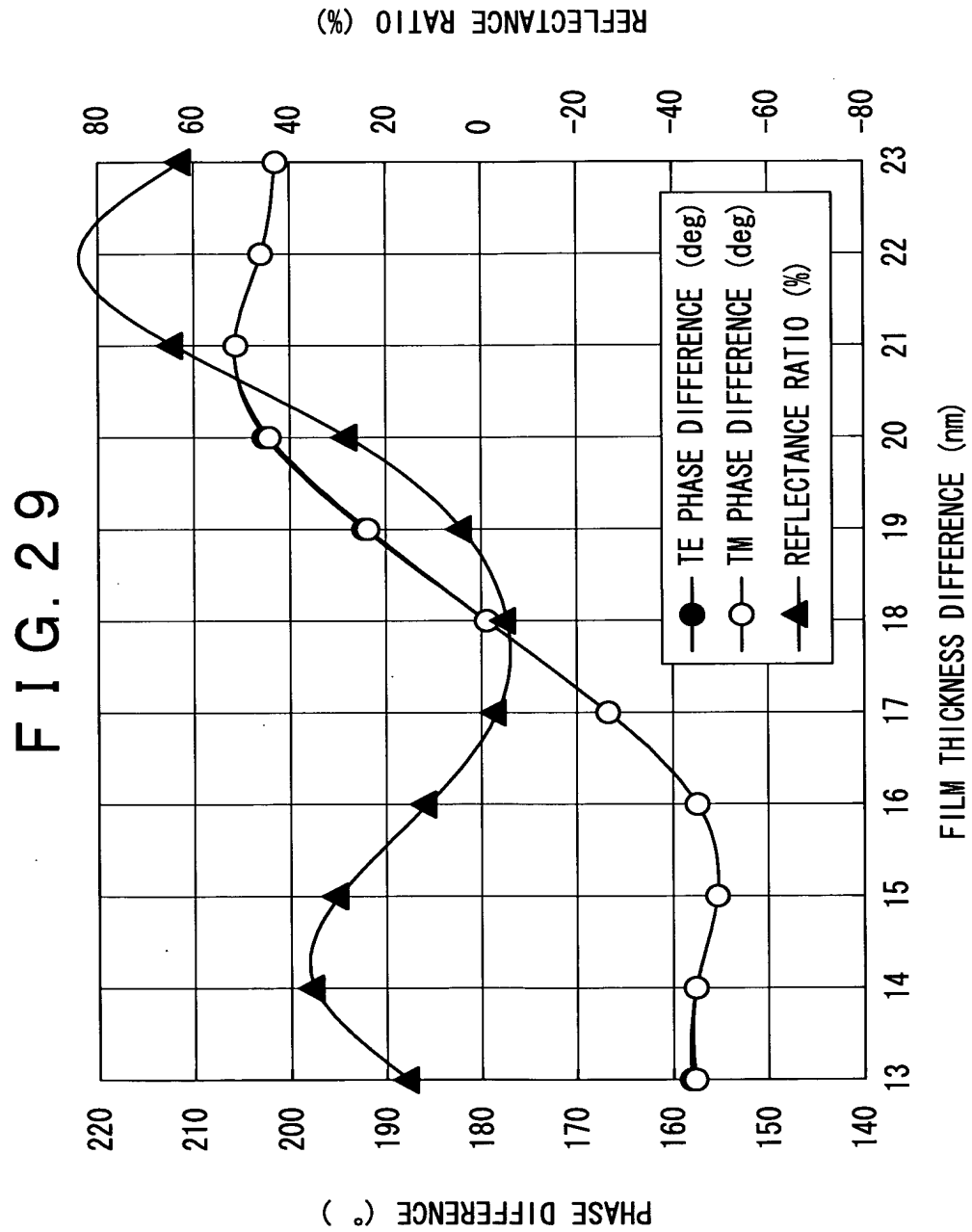


28/48

FIG. 28

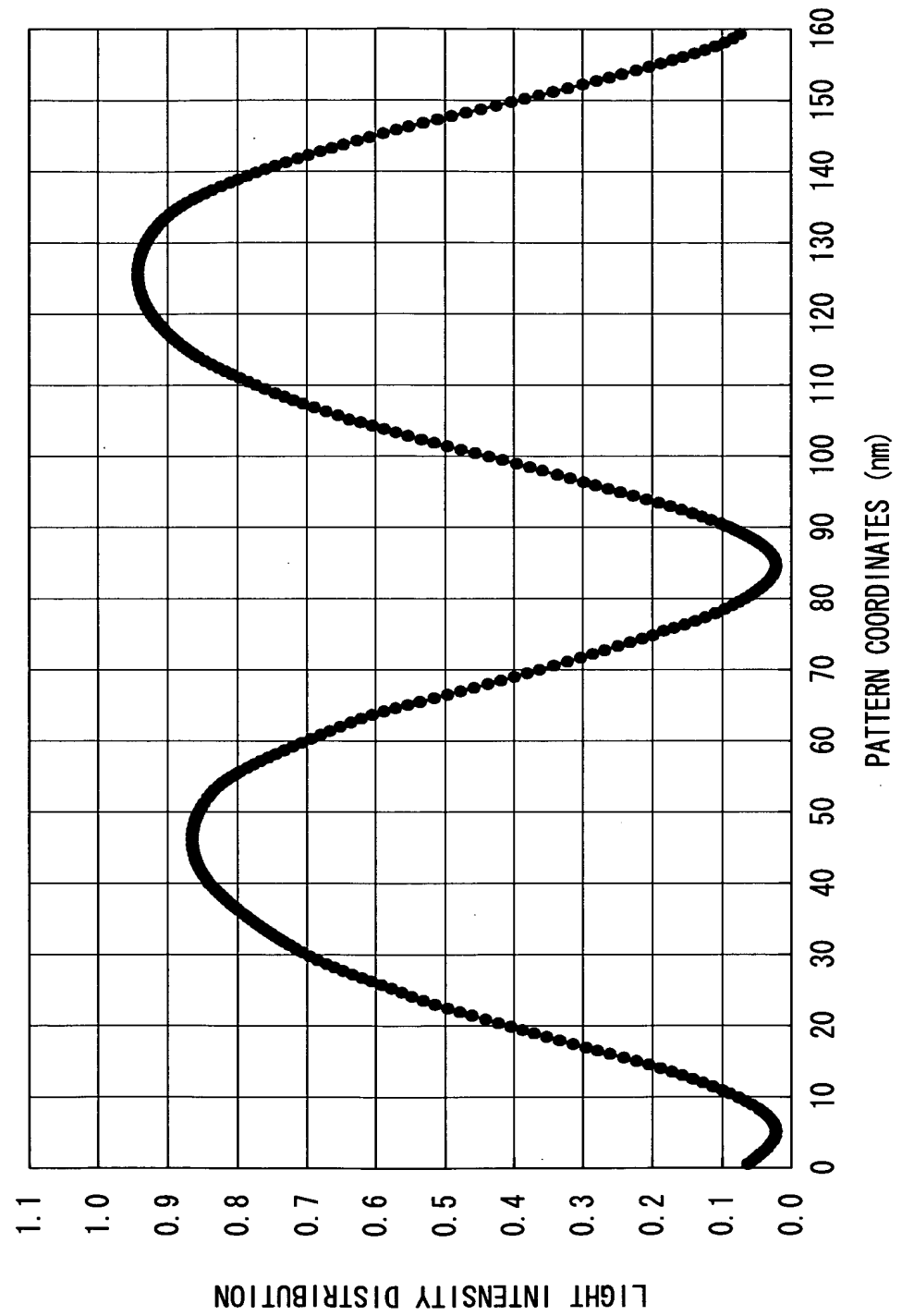


29/48



30/48

FIG. 30



31/48

FIG. 31

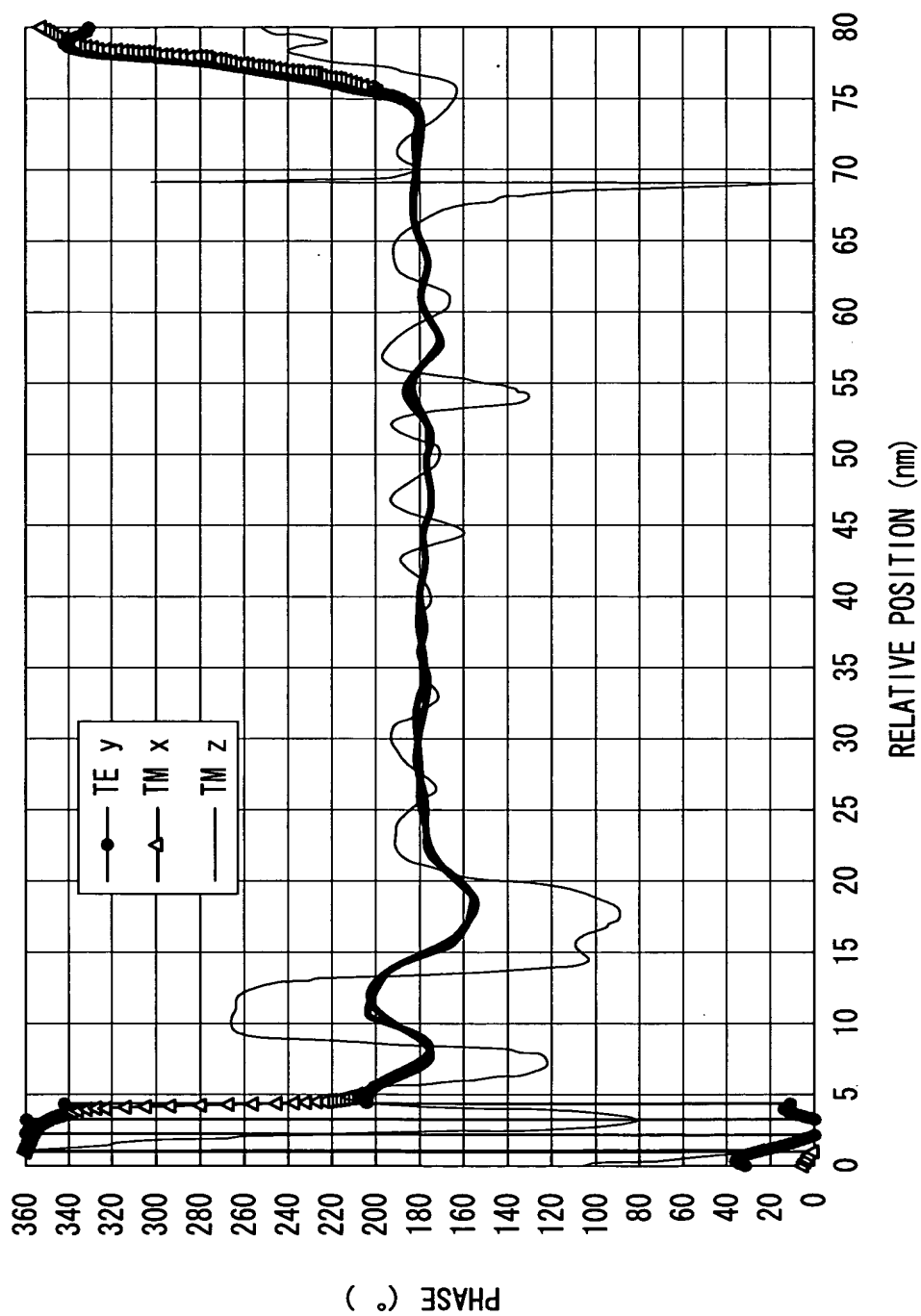


FIG. 32

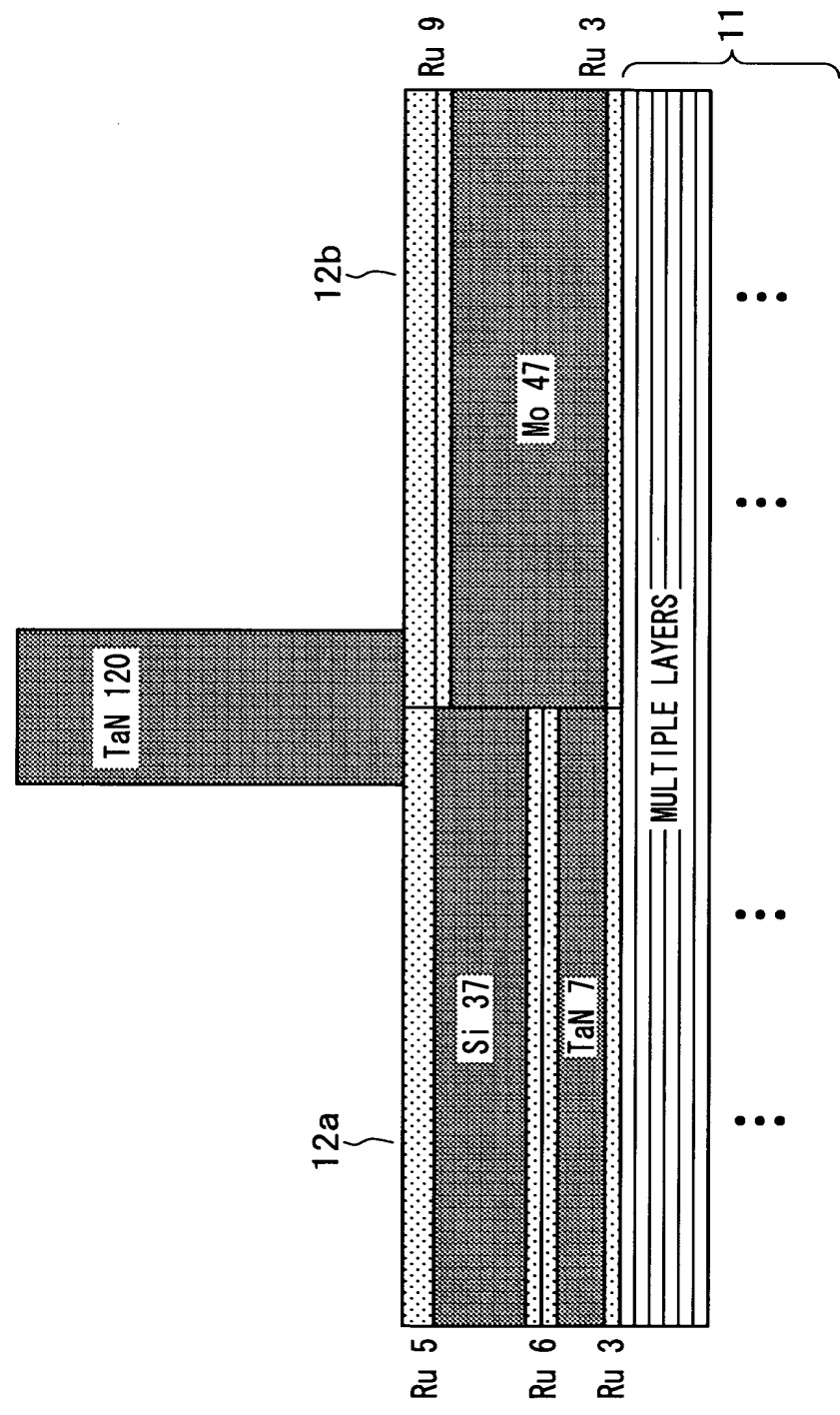
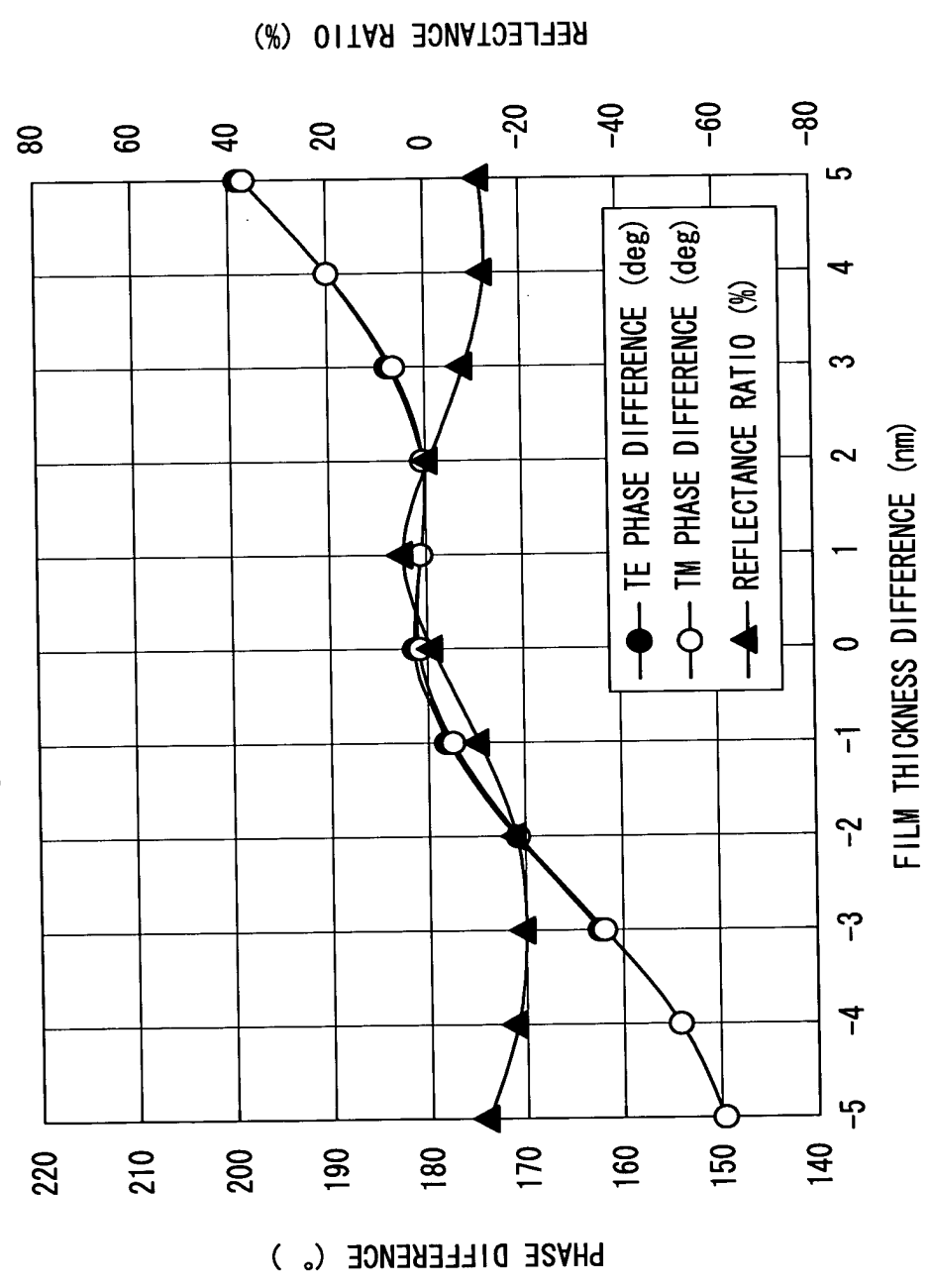
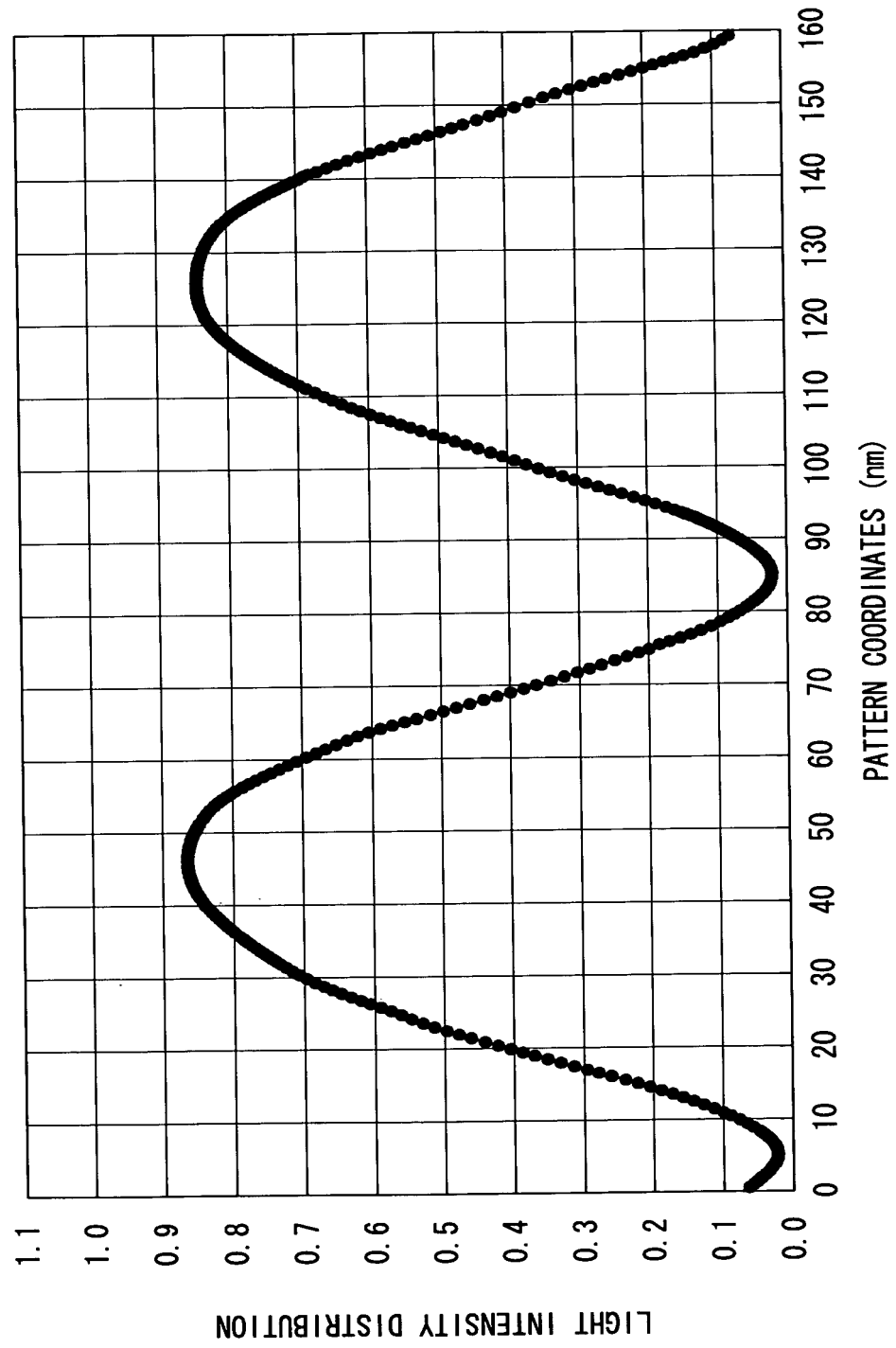


FIG. 33



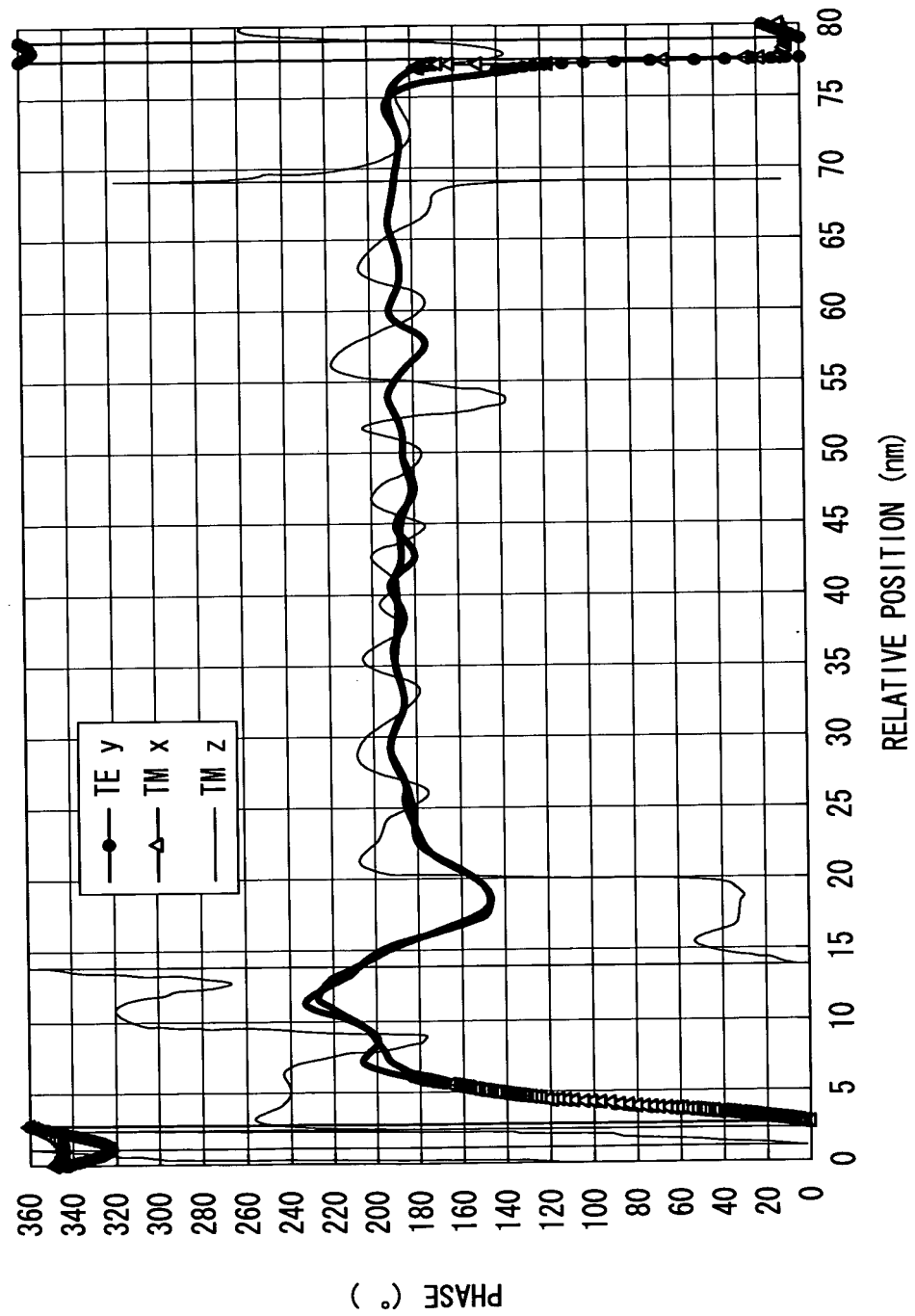
34 / 48

FIG. 34



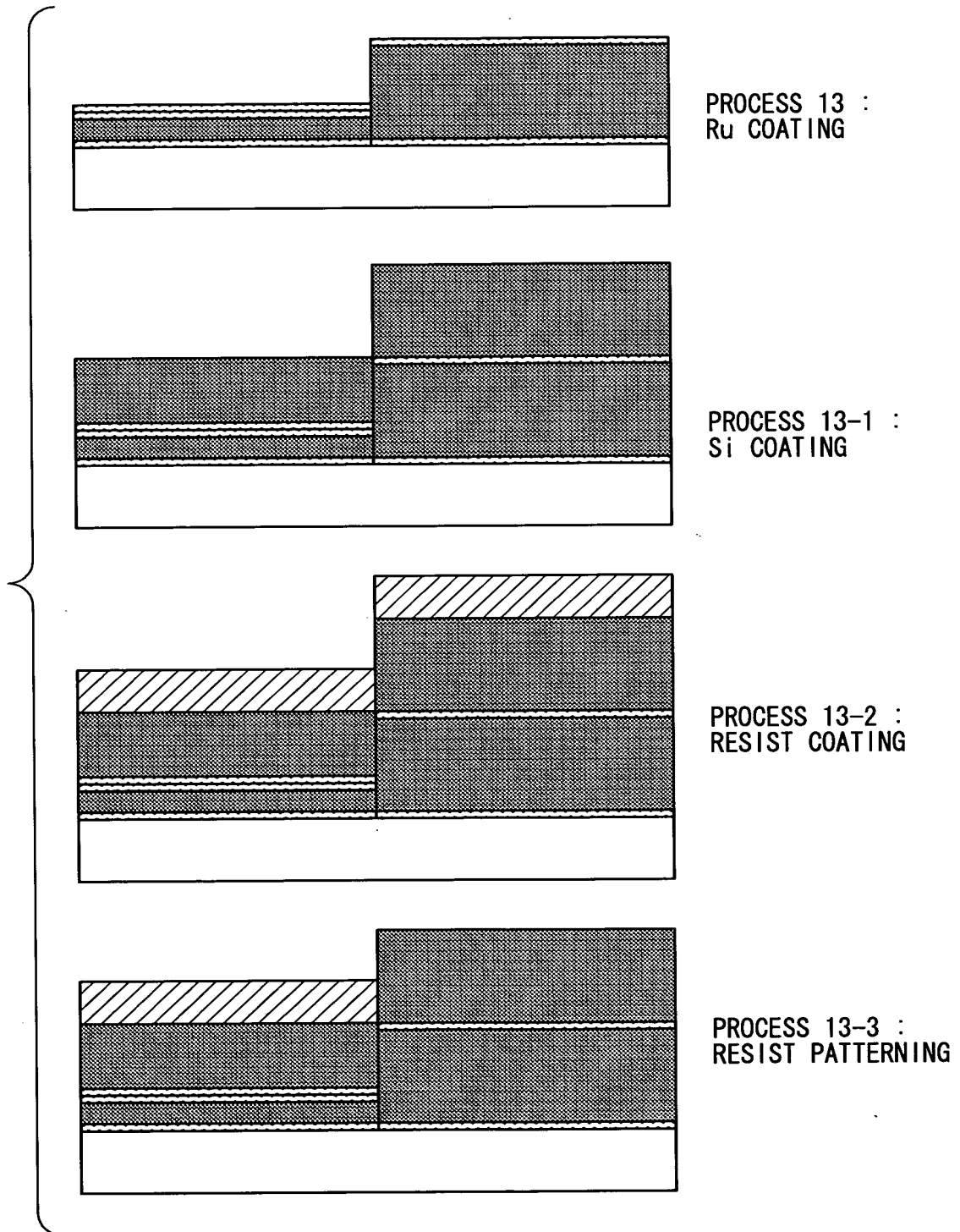
35/48

FIG. 35



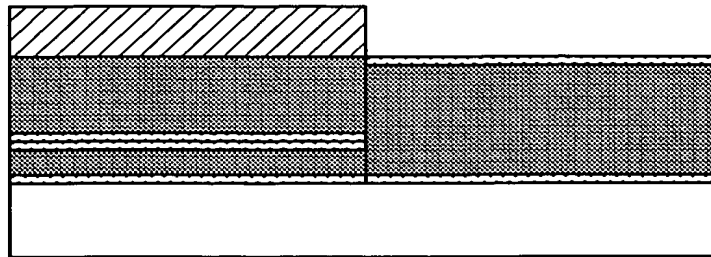
36/48

FIG. 36

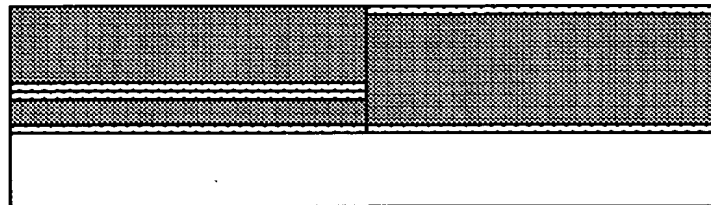


37/48

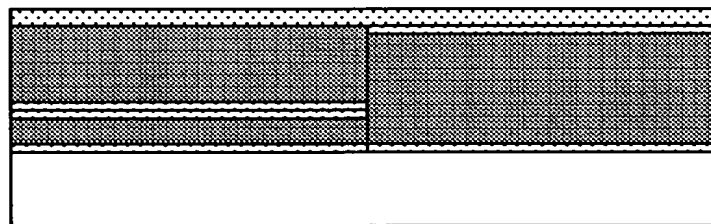
FIG. 37



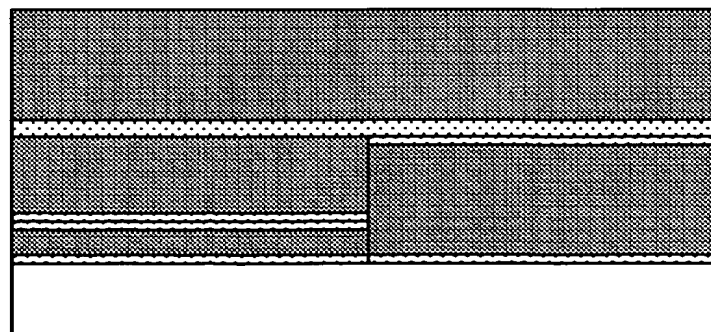
PROCESS 13-4 :
Si ETCHING



PROCESS 13-5 :
RESIST SEPARATION

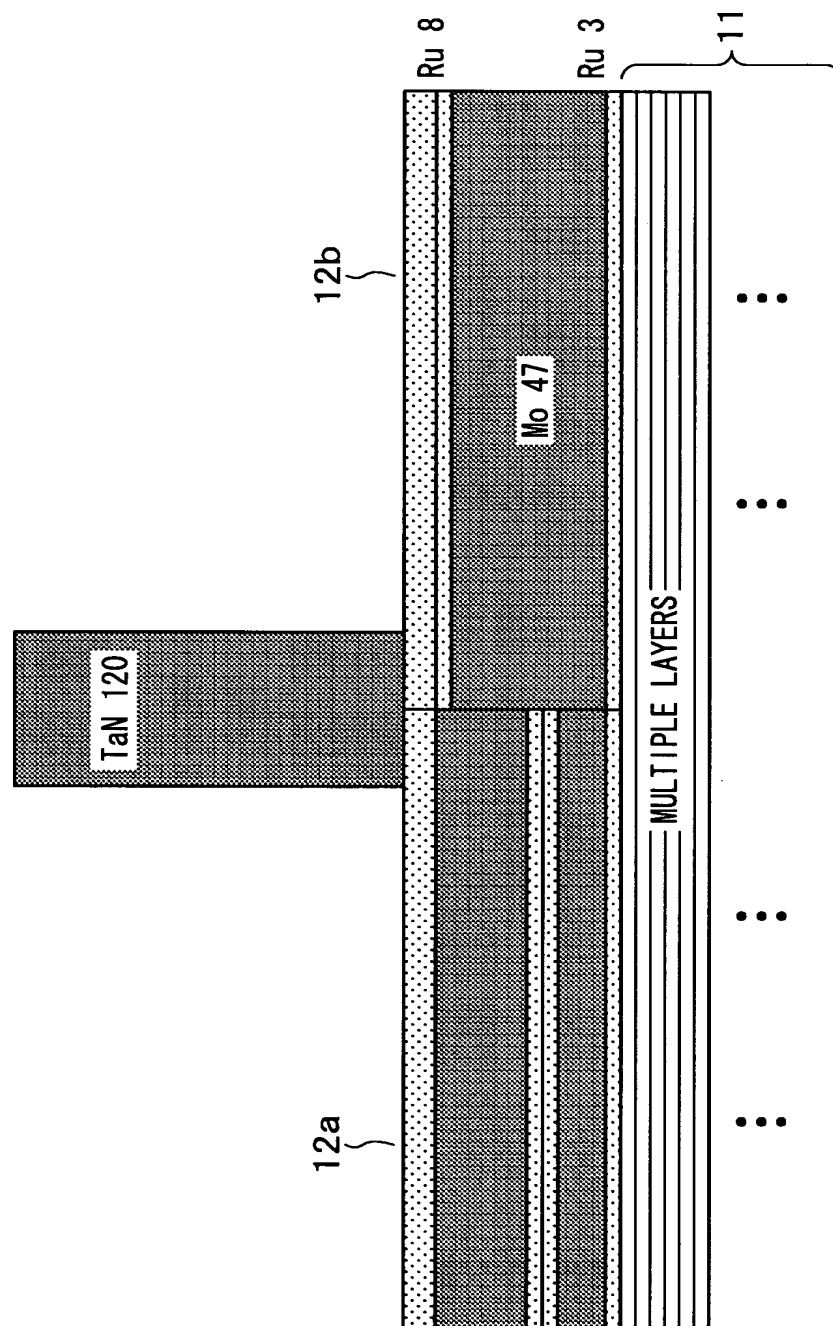


PROCESS 13-6 :
Ru COATING

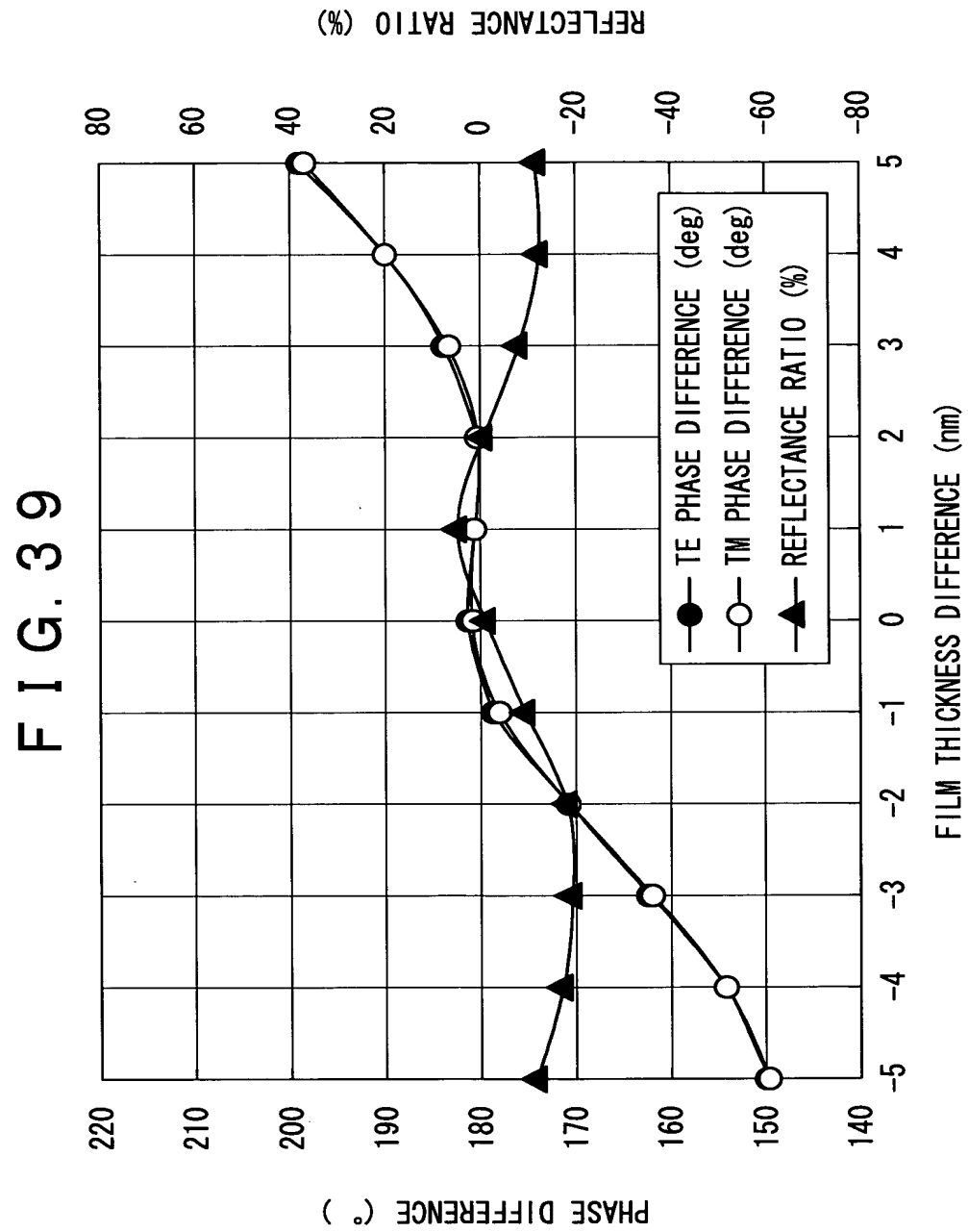


PROCESS 14 :
TaN COATING

FIG. 38

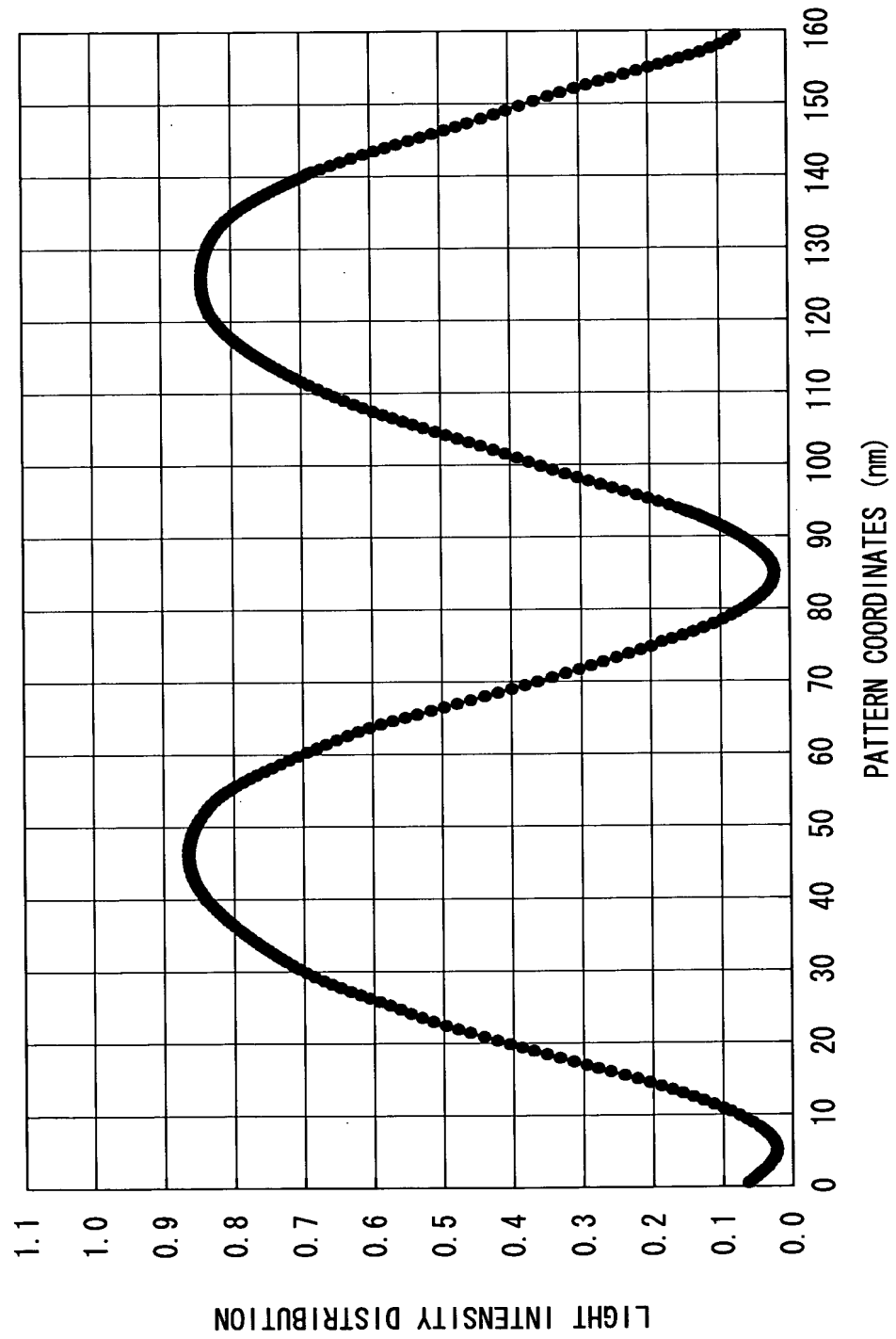


39 / 48



40/48

FIG. 40



41/48

FIG. 41

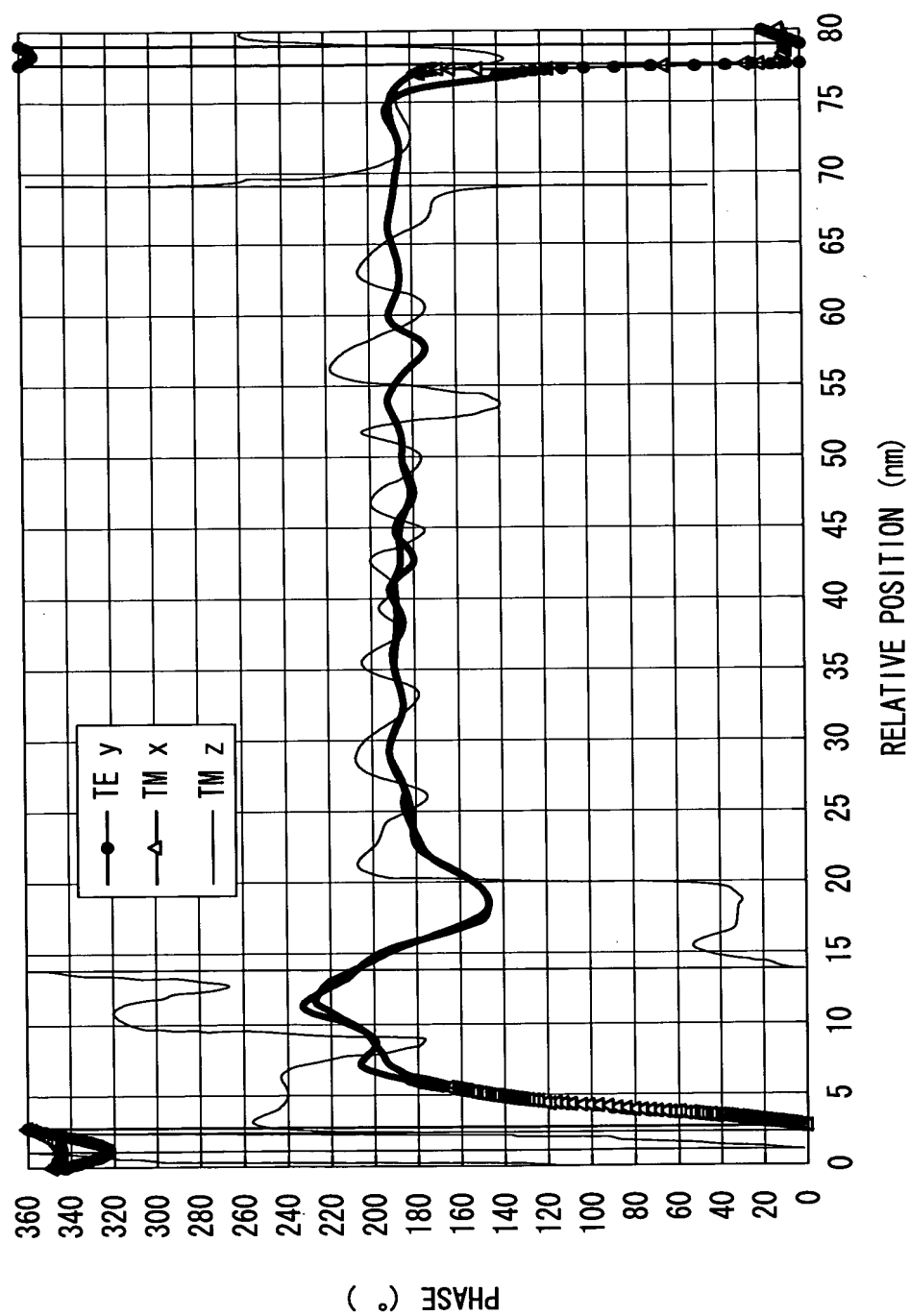


FIG. 42

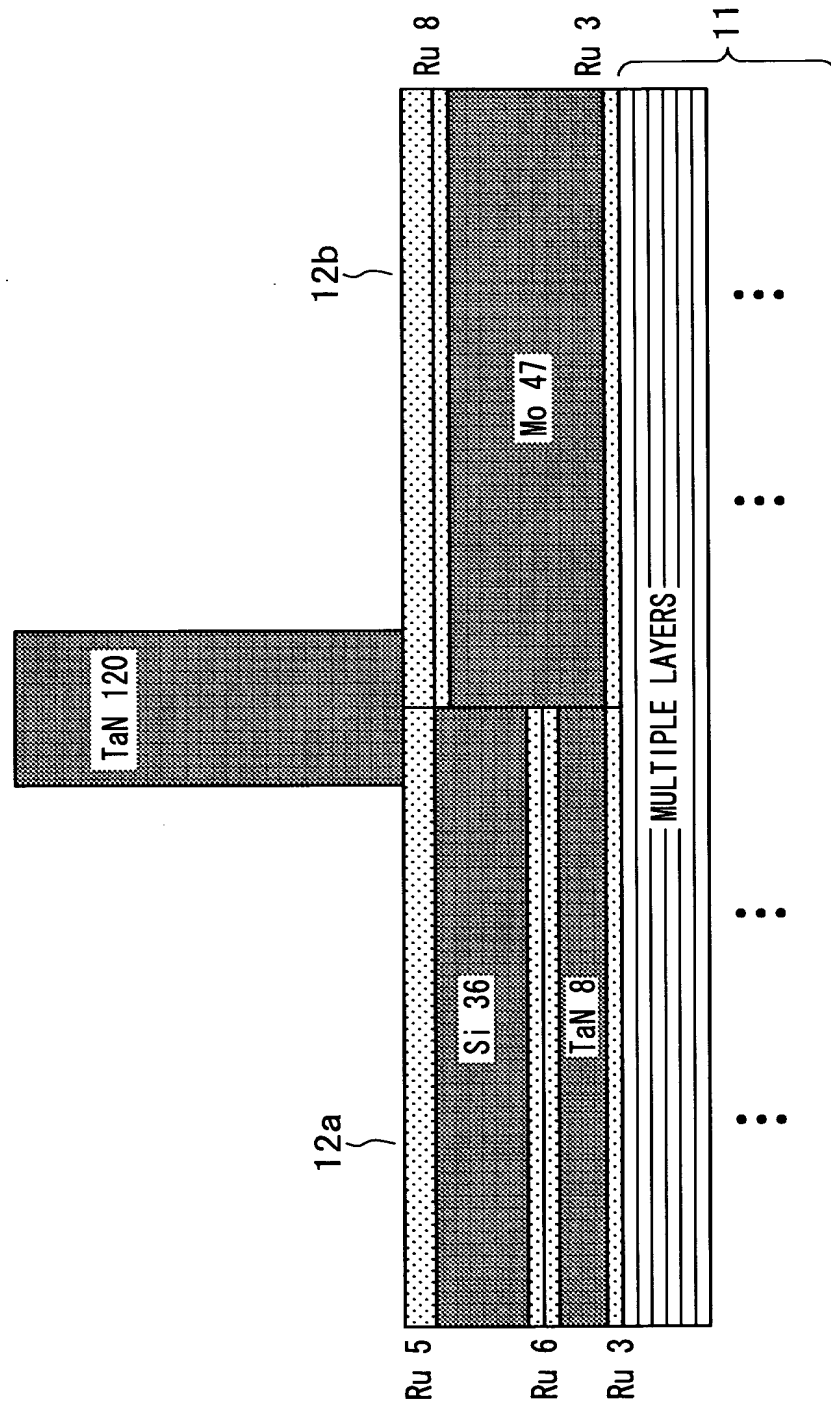
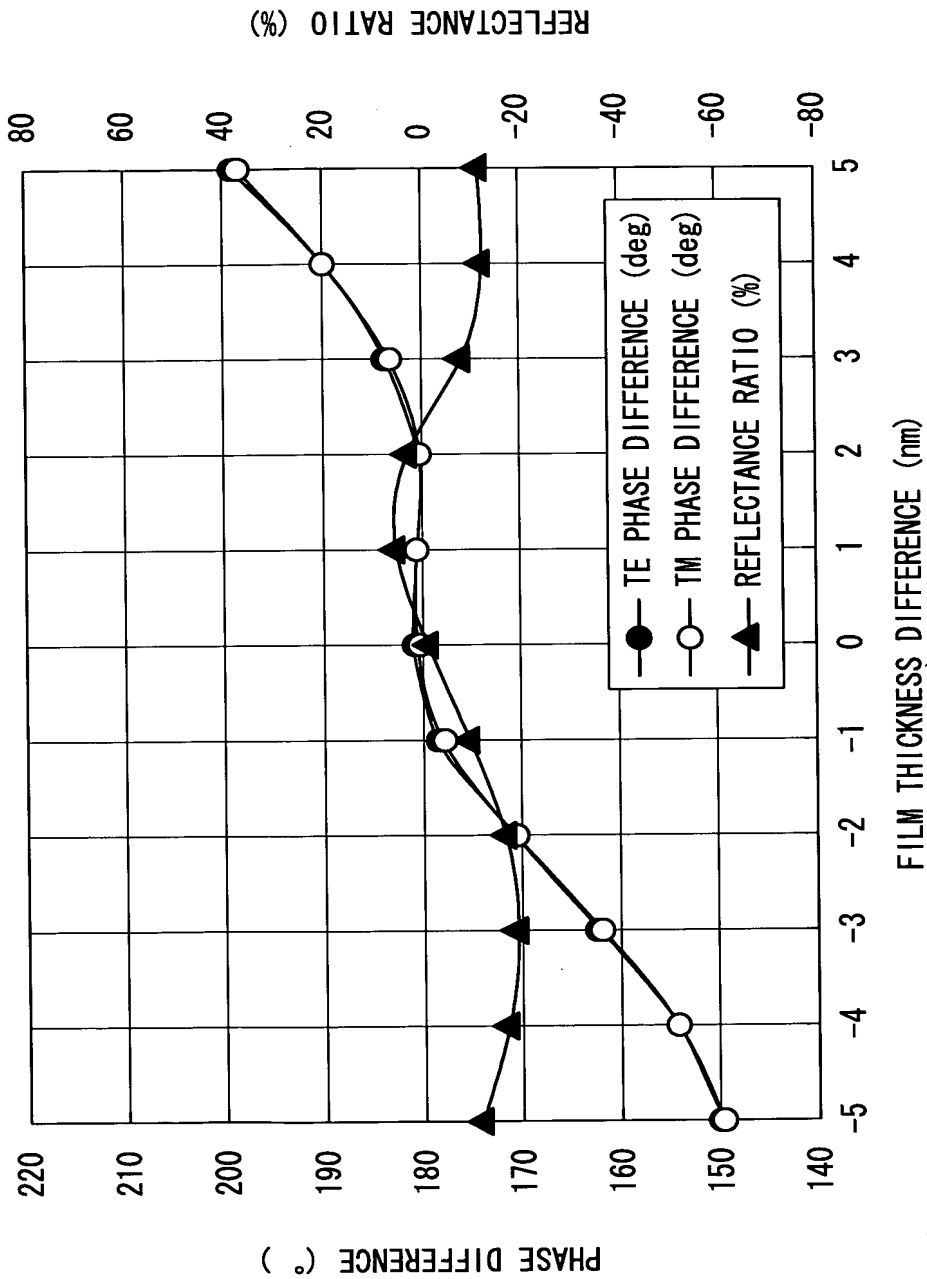


FIG. 43



44 / 48

FIG. 44

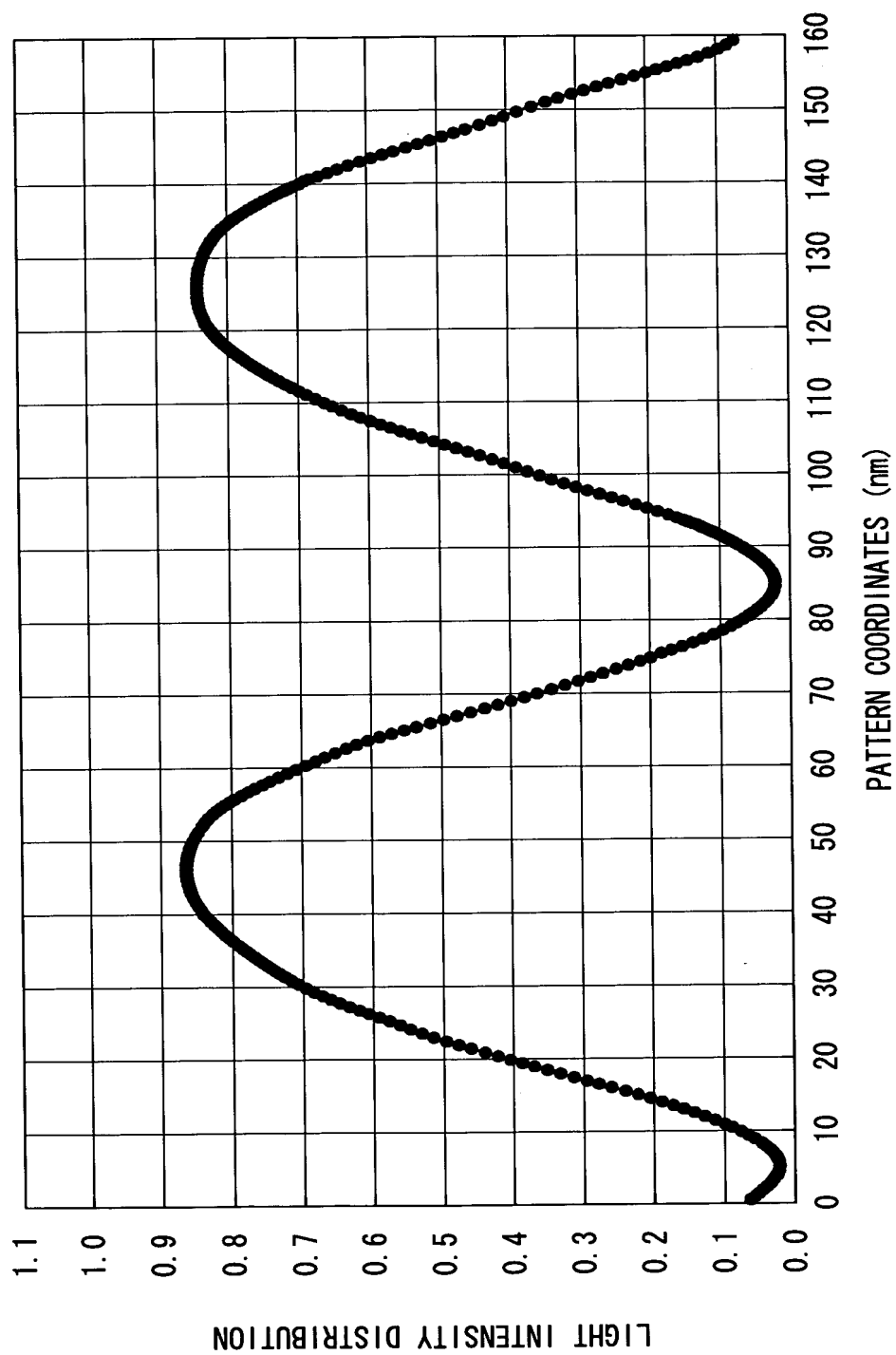


FIG. 45

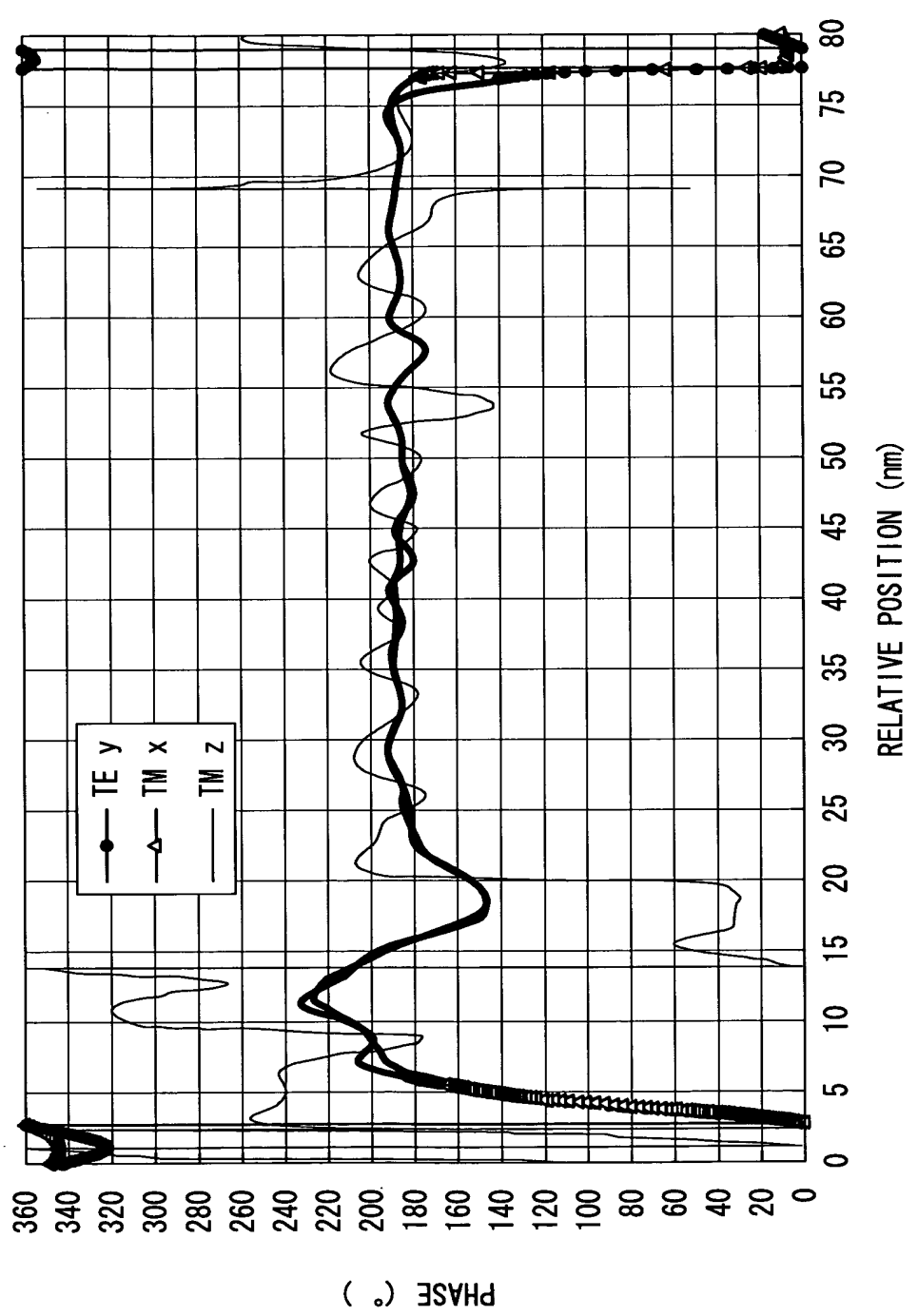


FIG. 46

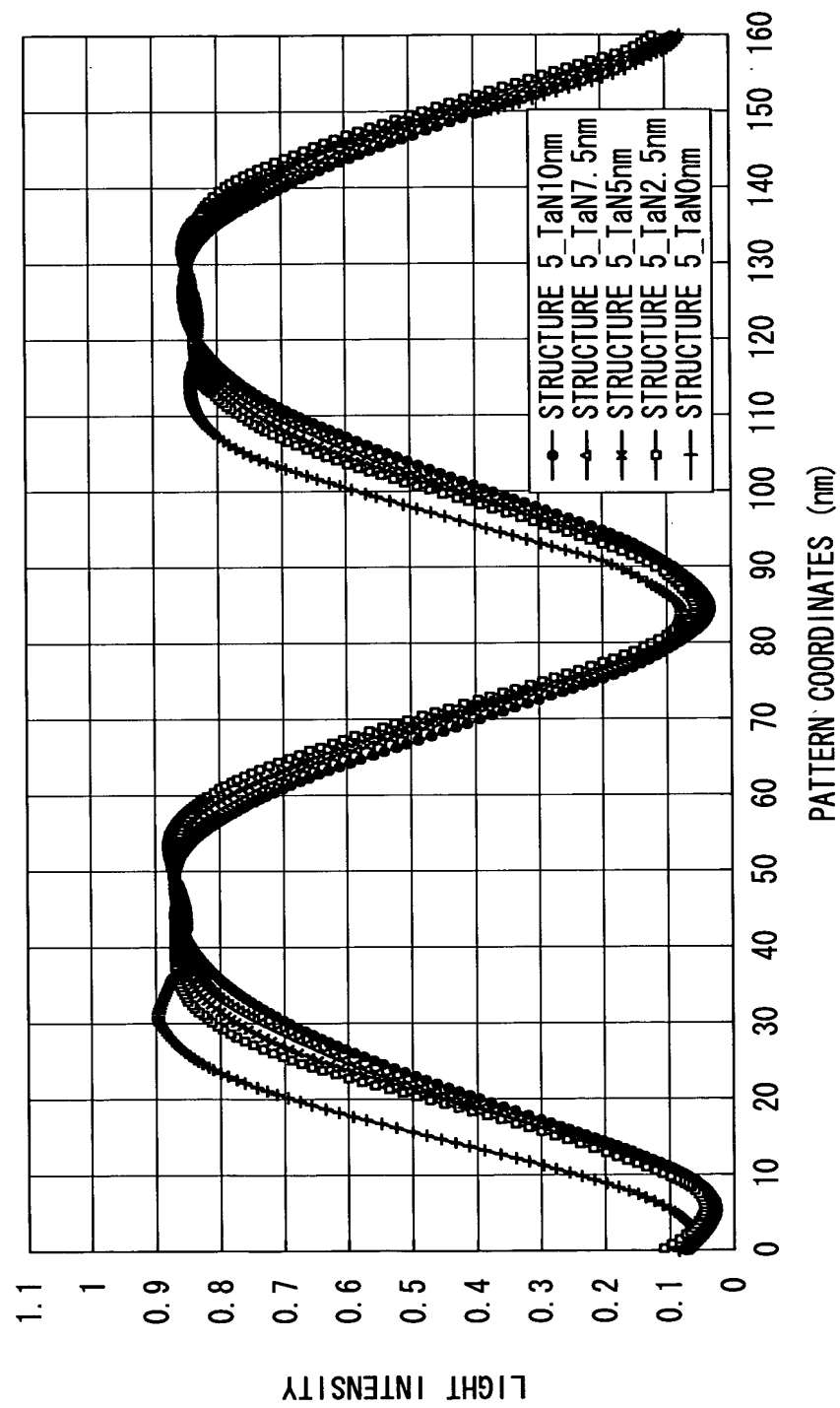
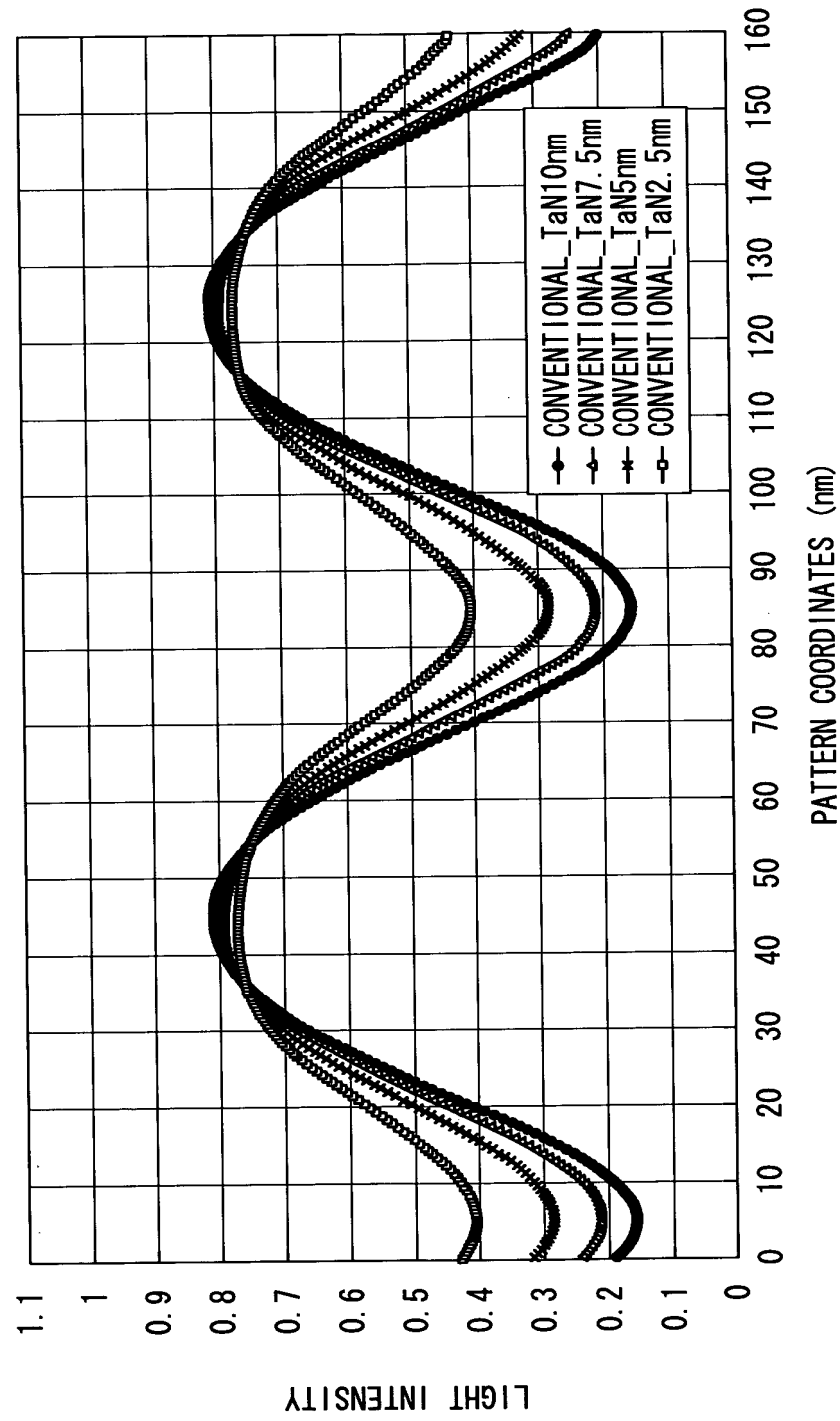


FIG. 47



48/48

FIG. 48

